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a. 1.

Sir J. McGrigor. Bart.

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August 18th 1797

AN

EXPOSITION

OF THE

PRINCIPLES

OF

Anatomy and Physiology.

VOL. I.

AN EXPOSITION OF THE PRINCIPLES OF Anatomy and Physiology,

FOUNDED ON THE

DISCOVERIES AND IMPROVEMENTS

OF THE

LATEST AND MOST APPROVED WRITERS,

AND CONTAINING THE

PRAELECTIONES ANATOMICAE

OF

FERDINAND LEBER,

TRANSLATED FROM THE ORIGINAL, PUBLISHED IN LATIN, AT VIENNA.

By WALTER VAUGHAN, M. D.

PHYSICIAN, AT ROCHESTER, IN KENT.

The gen'ral ORDER, since the whole began,
Is kept in NATURE, and is kept in MAN. POPE.

IN TWO VOLUMES.

VOL. I.

LONDON:

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MDCCXCI.

Ex Libris

Benjamini Floris-agri

DEDICATION.

TO

DOCTOR WILLIAM SAUNDERS,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, FELLOW OF THE ANTIQUARIAN, AND SEVERAL OTHER SOCIETIES, SENIOR PHYSICIAN TO GUY'S HOSPITAL, LECTURER ON THE THEORY AND PRACTICE OF PHYSIC, &C. IN LONDON.

MY DEAR SIR,

IF the Favours which you have conferred on me had been the Rewards of domeſtic Service, if they had been the Effects of Importunity,—or gained otherwiſe than by my honeſt Labours in learning and exerciſing the Healing Art,—I ſhould not have

 ſingled

ſingled you out of all my Friends as moſt deſerving ſo public a Teſtimony of my Gratitude.

You who have taught and practiſed Medicine ſo long with ſuch juſt and univerſal Applauſe, and have acquired ſuch Dignity and Reputation, are far above my Praiſe. But, as a grateful Scholar, permit me to aſſure you, that my conſtant and warmeſt Prayer is for the Happineſs and Honour of your future Life.

I am, dear S I R,

With the greateſt Reſpect,

Your moſt obedient humble Servant,

WALTER VAUGHAN.

Rochester,
Oct. 11, 1790.

PREFACE.

IT is a complaint equally true and lamentable, that the number of books on Anatomy and Physiology is too great, and that there is none which is not either so prolix and imperfect as to distract the most intent reader, or so concise and difficult as to deter even the student.

Books on Anatomy seldom treat of Physiology, but contain mere Descriptions of Parts, without any relation to their primitive formation, their possible changes, or their functions and actions. Hence, the study of Anatomy has always been accounted difficult and tiresome, and Books and Professors have been esteemed in proportion as they united an easy Physiology and Pathology to their Anatomy.

 Boerhaave

Boerhaave was the firſt who ſucceſsfully united the Phyſiology to the Anatomy *(a)*, and Haller, his ſcholar, found it afterwards neceſſary to attempt a ſimilar work; in which attempt he far exceeded his maſter *(b)*. But Haller never intended to make his work more than an abridgment; ſo that he has frequently made aſſertions, and frequently contradicted, without aſſigning the motives for either. Perhaps he wiſhed the curious to ſearch his *Elementa*; but if he had ſeriouſly conſidered their price and ſize, he might eaſily have been convinced that they were too expenſive for the generality of purchaſers, and too voluminous for the generality of readers.

(a) Boerhaave wiſely thought " *propriorum cogitatorum; Explicatione docentem plus proficere, quam ſi Opus ab alio conſcriptum interpretari ſuſcipit. Sua quippe optime intelligit, ſua cuique prae caeteris placent, unde clarior fere Doctrina, atque animata plerumque ſequitur Oratio.*"
Praef. ad Inſt. Med. Ed. Leid. 4.

(b) Haller obſerves " *etſi antea Boerhaavii Libro ad ordinandas Praelectiones uſus fuerit, proprias tamen poſtea in Paginas dicere incepiſſe, quod ab iſtius inde Temporibus Anatome ita locupletata ſit ut a ſe ipſa plurimum differat, &c.*"
Praef. ad Primas Lineas Phyſ. Ed. Goet. 1747.

In

In imitation of Boerhaave and Haller, Doctor Blumenbach, a Profeffor at Gottingen, has lately publifhed *Inftitutiones Phyfiologiae*; he likewife imagining that he could teach better from his own book, in which he had availed himfelf of late improvements, than from that of any other who had written before him. But in this work, I think, there is too little Anatomy, and too much Phyfiology and Hypothefis.

I know a Profeffor, juftly celebrated at this time, whofe lectures on the bones are as pleafant as on any other part of the animal body; I think they are more pleafant, for he makes fo many phyfiological and pathological remarks, that while he fixes in one's memory the fituation, connection, figure, &c. of every bone, and every bony procefs, he enlivens his defcription with a continual reference to the fame bone, or bony procefs in brute animals, illuftrates its ufes by familiar examples, and confirms his doctrines both by Phyfiology and Pathology.

It is certain, the mind is greatly alleviated by alternately changing pure deſcription for reaſoning; and it is moſt retentive of cauſes and effects, when it has once perceived their connection with each other. I know not what led me to think myſelf capable of executing ſuch a work as I now offer to the public; but as I had ſenſibly felt the want of it myſelf, it can hardly be deemed unnatural that I ſhould attempt it for the ſake of others.

Even when I had finiſhed it, for no man ever helped me in any other way than by lending me books,—I was ſo diffident of its merit, that had I not been urged by many who peruſed it, and chiefly by my good friend and late preceptor, Doctor William Saunders, who promiſed it a moſt honourable deſignation, it had ſtill been withheld from the preſs.

It was my original deſign to comprize the whole in a ſmall ſpace. I did not even think of tranſlating the *Praelectiones anatomicae* of Leber.

Leber. But I had ſcarcely begun, when I was led, by the high character which Leber's book bore in the Univerſity of Edinburgh, to make it a part of my own work. After having peruſed it, with great care, it ſeemed very ſuitable to my purpoſe, for I thought it, of all the Syſtems of Anatomy which I had ever ſeen, the plaineſt; ſhort indeed, but neither obſcure nor very defective *(c)*; ſo

(c) Winſlow's *Expoſition Anatomique de la Structure du Corps humain* contains ſcarcely any thing about the Abſorbing Veſſels; and Sabatier's *Traité Complet d'Anatomie*, which has never been tranſlated into Engliſh, contains only what our countryman, Mr. Hewſon, had publiſhed long ago. Beſides, both of them want much which might be added from the writings of the moderns, and have ſo much error blended with their good, that to diſtinguiſh the one from the other, ſuppoſes at leaſt a knowledge of both.

Verheyen and Palfin I ſay nothing of, becauſe the former is ſhown, by Heiſter, to be egregiouſly faulty, and the latter, an uſeful book, is written with a view to Surgery.

Treatiſes on particular ſubjects in Anatomy, and *Compendia*, are too numerous to be ſeparately ſpoken of. The latter can only be uſeful to proficients, or in Schools of Anatomy.

An

ſo that I doubted not but it was ſafer and more becoming to introduce it in an Engliſh dreſs, than to riſque my own reputation in unneceſſarily compoſing anew.

All, therefore, that I have done in the anatomical part of this work is to render that of Leber perfect. What is obſcure in

An edition of Leber has been lately publiſhed at Edinburgh, by Doctor Wilſon, in conſequence of the great deſire for that book; and he has added to it *Obſervationes quaedam phyſiologicae et anatomicae*, in thirty-four pages. Of the neceſſity for thoſe obſervations, without more, I leave others to judge. I cannot, however, help remarking, that although I have compared the work itſelf, as publiſhed by Doctor Wilſon, with my own copy publiſhed at Vienna, and find no material difference, yet Doctor Wilſon, for ſome reaſon which I cannot divine, has omitted the preface to the German Edition, which Leber prefixed to the Latin! I have, however, tranſlated it, and placed it as it was deſigned by Leber; and when it is conſidered that Leber has given no plates, but has acquainted us, in this preface, which he preferred, and pointed out the authors, which he thought moſt worthy to be conſulted, and which he had conſulted in writing his own lectures, I think I ſhall be conſidered as having done as I ought.

him,

him, I have endeavoured to illuſtrate ; and what is erroneous, I have endeavoured to correct. I have, however, been ſo cautious, and ſo convinced of the goodneſs of his work, that I have ſpared no pains to deliberate on every part that ſeemed exceptionable. And wherever I ventured to differ from him, I have done it ſo modeſtly, that I cannot ſuppoſe Himſelf, or his Admirers, will be ſo infatuated and vindictive as to ſearch after, and magnify faults in mine, only becauſe I have diſcovered ſome in his. I am not deſirous to exalt myſelf into an antagoniſt, under any pretence.

As for the omiſſions in Leber, I have ſupplied them as often as I could, by ſelecting carefully, and arranging methodically what is admitted by acknowledged judges, or ſeemed certain to myſelf. He is chiefly deficient in his ſection on the *Lymphatic Veſſels*; and in the *Splanchnology*, he has ſcarcely ſaid any thing ſatisfactory about them. But, as he referred us to Hewſon for farther information on them, it is probable he only copied from him.

Profeſſor

Profeſſor Leber has given no Figures; neither have I given any. Of his deſcriptions, however, it may be ſaid, as it was of Linné's "*Figuris non egent.*"—I think Figures are of little, if any uſe, unleſs to thoſe who are attending Lectures, or who have attended them; and of no uſe at all to thoſe who never attend any. I am much of the ſame opinion as Haller, who thought it ridiculous to confine the eye to an "*inane album Arteriarum, Venarum, et Nervorum.*"

The phyſiological part is entirely mine: if I may call that mine, which I adopt, and hold to be right, and which I have incorporated into a regular ſyſtem.

Nobody, I flatter myſelf, will ſay I have done an uſeleſs work; becauſe I refer to every claimant that which I believe to be his due. And ſhould I ever ſeem, by omitting an acknowledgment, to arrogate to myſelf the property of another, I would have it underſtood that I thought it mine, when I wrote it.

As I have not taken authorities from authority, the number of my authorities will give authenticity to my work. And whilſt they prove my diligence, they will ſerve to direct the inquiſitive to the beſt ſources.

Some praiſe, I think, may not unreaſonably be expected for citing none but good authors: and more may certainly be claimed for not having cited their errors *(i)*.

The fallibility of human judgment is univerſally known. The reverence due to ancient authors, and the prejudice againſt the modern; the prevalence of cuſtom, the mutability of form, and the preſcriptive ſuffrage of exalted characters; are, all of them, in ſome manner, unfavourable alike to the innocent temerity of youth, and the pertinacity and ſcepticiſm of old age.

(i) Ex libris colligere quae prodiderunt authores, longe eſt periculoſiſſimum: rerum ipſarum vera cognitio è rebus ipſis eſt.

J. C. Scaliger.

I hope,

I hope, I have not been unwarrantably officious in giving my own opinion; nor too resolute in maintaining it. I hope, I shall not seem to have dealt superciliously by any man; or to have given his doctrines too briefly, or in ambiguous and doubtful language; for I confess, I love to think for myself; and rather to view things by the light of reason, than the deceitful medium of authority *(j)*.

I would not have it supposed that I renounce all probable conjecture. For where I cannot employ my Reason, I love to hu-

(j) " To speak generally, an argument from authority to wiser examinations, is but a weaker kind of proof; it being but a topical probation, and as we term it, an inartificial argument, depending upon a naked asseveration; wherein neither declaring the causes, affections, or adjuncts, of what we believe, it carrieth not with it the reasonable inducements of knowledge. And, therefore, *Contra negantem principia*, *Ipse dixit*, or *Oportet discentem credere*, although postulates very accomodable unto *junior* indoctrinations, yet are their authorities but temporary, and not to be embraced beyond the minority of our intellectuals.

Brown's Vulgar Errors, chap. vii."

mour

mour my Fancy. But if this be deemed a fault, I have committed it ſo ſeldom, that my benevolent reader will eaſily forgive me. Indeed, I cannot be accounted very reprehenſible for it, ſince what is given only as uncertain, can hardly be taken for certain.

That I have made Notes which are unneceſſary for many, is not to be wondered at. An Expoſitor, however diffident and circumſpect, muſt write too much for ſome, and too little for others.

I have, on all occaſions, conſulted order, and endeavoured to avoid needleſs repetition. And if in any inſtance I have adduced contrary opinions, without reconciling either, or any of them, to truth; I would apprize the reader, that the authors of both, or of all the opinions, are equally intitled to belief, and that to have determined which had the better cauſe, ſuppoſes more ample knowledge and more acute diſcernment than I can pretend to poſſeſs.

In my language, as I am not ſtricken in years, nor uſed to compoſition, I only aim at accuracy. If I unfortunately ſeem affected, I can ſafely affirm that I affect nothing ungrammatical or palpably erroneous; nothing that can make my ſtile intricate, or my meaning obſcure and uncertain. Should my manner be peculiar, there is nothing blameable in it, becauſe I could not help it; and, if I judge right, ſingularity in this reſpect may be advantageous.

However anatomical language may need improvement, and however reaſoning and language may be conſidered as connected *(k)*, I have conſulted neither Skinner, nor Junius,

(k) The Abbé de Condillac's Maxims are held in great eſtimation by Monſ. Lavoiſier, who quotes him, ſaying —" We think only through the medium of words— Languages are true analytical methods.—Algebra, which is adapted to its purpoſe in every ſpecies of expreſſion, in the moſt ſimple, moſt exact, and beſt manner poſſible, is, at the ſame time, a language and an analytical method —The art of reaſoning is nothing more than a language well arranged.

Traité Elem. de Chimie.

about

about the etymology of old words, or the utility of making new words. For I am not extravagantly fond of innovation, and as Books on Anatomy have long ſince worn a party-coloured dreſs, I am not inclined, at preſent, ſo far to tranſgreſs the majeſty of cuſtom as to ſtrip mine of it.

Publica forma placet Sermonis:
Verba valent Uſu, ſicut Nummi.

WALTER VAUGHAN.

THE PREFACE OF PROFESSOR *LEBER* TO HIS LATIN EDITION OF THESE LECTURES.

IN the preſent Edition I have ſupplied the Defects, and corrected the Inaccuracies in the German Edition of this Book. The Order, which I have followed for theſe fifteen Years paſt, ſince I acquired a Profeſſorſhip, I always accounted the beſt and fitteſt for my public Lectures. For which Reaſon,

 I have

I have rendered this Work more uſeful as well as more agreeable. I had, indeed, a Mind to ſuggeſt Cautions neceſſary in the Practice of Surgery; as I always do in my public Lectures: But I changed my Mind, leſt my Work ſhould be too large.

VIENNA,
Feb. 13, 1777.

THE

PREFACE

OF

PROFESSOR *LEBER*

TO HIS

GERMAN EDITION

OF THESE

LECTURES.

I HERE offer a ſyſtem of Anatomy, written in the German Language; ſenſible that it is my duty, eſpecially at this time, to furniſh my ſtudents with it. For I confeſs, I long wiſhed for ſuch a work, and long felt the loſs of it. It is clear that the want of a Book in the vernacular idiom has re-

tarded the acquirement of Anatomy among German ſtudents who were ignorant of the Latin Tongue. Hence many celebrated men have openly declared the uſefulneſs of a work of this kind.

Anatomical Science is of itſelf tireſome to the memory. And a vaſt inundation of technical Terms, as well Greek as Latin, is not only more tireſome, but alſo more perplexing. The progreſs of Anatomy has therefore been very much obſtructed by it. A German Tranſlation of the technical terms, and a German Expoſition of the whole Science of Anatomy, muſt render it more eaſy, eſpecially as I have taken all poſſible pains to give definitions exact, ſhort, and intelligible. The technical terms may not only be retained with eaſe, when they are written in the German language, but they are more illuſtrative of the ideas of things, to German ſtudents, than when written in Latin. Beſides, an expoſition of Anatomy in German, without the mixture of Latin words, muſt be of the ſame importance.

portance. For it is equally as neceſſary to underſtand the connection and order of things, and the names by which they are ſignified, as the things themſelves.

This method will, perhaps, ſeem difficult to thoſe who have learned Anatomy variegated with Latin terms: But they who are beginning to learn it, will, I think, find it eaſy.

I have now aſſigned the motives for undertaking and completing this work. My end was to do good, and the ſatisfaction which I have always felt in being ſerviceable to my neighbour, by the diſcharge of my duty, will be the only reward that I wiſh for.

If any one be deſirous of being better inſtructed than he can by my Lectures, he may conſult the *Elementa Phyſiologiae* of HALLER, the *Expoſition Anatomique* of WINSLOW, the various works of MECKEL,

the *Osteology* and *Neurology* of MONRO, the *Osteology* of BERTIN, and the *Doctrine of the Lymphatic Vessels*, by HEWSON.

The best figures are the *Tabulæ Myologicae*, et *Osteologicæ* of ALBINUS, the *Tabulæ Myologicæ* of COWPER, and the *Tabulæ Anatomicæ* of HALLER. Formerly, ALBINUS gave figures of the Gravid *Uterus* : But the most exact, most elegant, and useful are those of the great London Anatomist, DOCTOR HUNTER.

Of the *Ligaments*, the Tables of WEITBRECHT, of the *Cardiac Nerves*, the Tables of NEUBAVER, and of the *Brain*, the Tables of TARIN, are most esteemed. Should any one be desirous of Tables of all Anatomy, the most exact are those of EUSTACHIUS, published by ALBINUS.

The present work may be considered as the *first Part* of my Lectures. I shall

publish

publiſh the *ſecond Part*, or *Lectures on Surgery*, in compoſing which I am now engaged, next year.

CONTENTS

CONTENTS

OF THE

FIRST VOLUME.

Ossicula

Cubit

LIGA-

VENOUS

OF

ANATOMY

IN GENERAL.

ANATOMY ([1]) is a ſcience teaching the fabric of the human body ([2]), by an artificial diſſection of its parts.

Anatomy

([1]) The ſtrict meaning of the word ANATOMY is *Diſſection*, or the *cutting Parts aſunder* (See the *Compoſita ex* ΤΕΜΝΩ, in Scapula's Lexicon.). But its common and general meaning is that given in the text. By "the fabric of the human body" is to be underſtood, the ſtructure, figure, number, magnitude, and connection of all its parts.

([2]) The anatomy which Profeſſor Leber teaches, is a ſcience of the human body only. But Malpighi, Grew, Feldman, Hales, Geſner, and Ludwig, are called by Linné ANATOMISTS (*Phil. Botan. edit.* 2. *p.* 15. § 44.); becauſe they examined the internal ſtructure of plants.

The examination of the fabric of brutes is alſo Anatomy. And a knowledge of the fabric of brutes and plants, when applied by analogy to explain the ſtructure and functions of man, is called COMPARATIVE ANATOMY.

Thomas Bartholine, though he defines Anatomy like Leber, acknowledges that brutes are alſo ſubjects of diſ-

Anatomy is divided into ſeven parts: viz.

1. Oſteology,		Bones.
2. Syndeſmology,		Ligaments.
3. Myology,	which delivers	Muſcles.
4. Angiology,	the doctrine	Veſſels.
5. Neurology,	of the	Nerves.
6. Adenology,		Glands.
7. Splanchnology,		*Viſcera.*

The

ſection. But his reaſons for confining his definition to the human body are very ſatisfactory. He does not diſſuade one from diſſecting brutes: on the contrary, he ſays, it is not the leſs uſeful for his not comprehending it in his definition of Anatomy; he ſays, it ought not to be neglected; whether we conſider the analogy between man and brutes, or anatomical and ſurgical practice: Laſtly, He tells us that Democritus ſearched after the ſeat of the bile in animals; that Galen diſſected apes and other animals; that Aſellius diſcovered the lacteal veſſels from diſſecting brutes; and that himſelf, as well as many others, whom he mentions, had diſſected animals of various kinds (*Anat. Reform. p.* 1.).

Of the *Analogy between Plants and Animals*, it may be right to ſay a few words. Plants, like animals, have veſſels, and fluids moving in them. Plants perſpire; and their perſpiration, ſays Hales, (Statical Eſſays, Vol. I.), is greater or leſs, as they are more or leſs expoſed; and as the atmoſphere is more or leſs loaded with moiſture. Plants abſorb alſo, as Hales, firſt of all obſerved: And Guettard (*Mem. de l'Acad. de Sciences*, 1749.), Du Hamel (*Phyſ. des Arbres. Tom.* I.), and Bonnet (*Traité des Feuilles. Mem.* I.) have aſcertained what parts of plants abſorb moſt, and what are the circumſtances increaſing and leſſening their abſorption. Plants have a ſecretion; for the *nectarium*, which is apparently a gland, ſecretes a liquor like honey. (Linnaei *Ammaen. Acad. Tom.* V.). Plants have a life alſo, and are ſtimulated by external cauſes; they are, like animals, capable of regenerating

parts

The Principles or Conſtituent Parts of the Human Body.

The Human Body conſiſts of *ſolid* and *fluid* parts (3). The ſolid parts are ſubdivided into

parts cut off, or otherwiſe deſtroyed (Bonnet *Contempl. de la Nature. Tom.* I. *p.* 6. *cap.* 10. and A. J. G. Murray's *De Redintegratione Partium Corporis Animalis*, &c. *Gott.* 1787.). Such is the analogy between plants and animals. The ſexes of plants *(Lin. de Sexu Plant.)*, their conſtant inclination towards the ſun, the power by which their roots turn aſide from veins of bad earth, and ſearch for good (Buffon, Vol. II. p. 7. Smellie's Tranſl.), the power by which they maintain a certain temperature, though different from that of the atmoſphere (Hunter, Phil. Tranſ. Vol. LXV.), and their ſleep, are objects well worth attending to; though they cannot be diſcuſſed here.

(3) This is a very old diviſion of the body; it differs little or nothing from that of Hippocrates *(Epid.* XII. VI. § 8.), and Galen; the former of whom called thoſe parts that contain fluids, or ſerve for their tranſmiſſion, CONTAINING PARTS. Conſequently there were CONTAINED PARTS. Hoffman, however, makes a formal ſubdiviſion of the fluid parts, and diſtinguiſhes thoſe that are obvious to our ſenſes, and contained in proper veſſels, blood and the fluids ſecreted from it; ſaying,—"There are others, more ſubtile, more active, and poſſeſſing the greateſt efficacy and power of motion, which Hippocrates called *Impetum facientia*, and the antients, who were ignorant of the nature of inviſible fluids, called *Spiritus*; becauſe they cauſe motion, actuate the ſolids, and moderate and govern the courſe of the fluids *(Med. Rat. Lib.* 1. *Cap.* 1.)."—Galen called the *impetum facientia*, SPIRITS, and the groſs fluids, HUMOURS. In a word, modern phyſiologiſts are content to ſpeak of Solids and Fluids only: the *partes contentae*, and *partes impetum facientes*, and *ſpiritus*, being now-a-day comprehended in the word *fluids*. Other diviſions of leſs moment may be found

into *hard* and *ſoft:* the former comprehending bones and cartilages, the latter, muſcles, viſcera, and all the other ſoft parts of the body.

The Solids of the Human Body.

The ſolids of the human body are either *ſimple* or *compound.* The parts, which are called *firm*, or the *ſimple* ſolids, formed of earthy particles connected one to another, by an intermediate animal gluten, ſupply the principles of our body (4).

A *Simple Fibre* is compoſed of a ſeries of ſuch earthy particles joined together by gluten (5).

If

found in Bartholine *(Anat. Reform.)*, Gliſſon *(Anatom. Hepatis)*, and Haller *(Diſſ. Phyſ. Gott. Apr.* 22. 1752.)

(4) It is wrong to ſay that the moſt ſimple fibres conſiſt of earthy particles joined together by intervening glue. For that glue may be formed of animal ſubſtance, is no proof that it exiſted, perfectly formed, in it. Haller even tells us that the earthy particles do not cohere by attraction, but by intermediate gluten *(Primae Lineae Phyſ.* § 4. 5. 6.): and Macbride aſſigned the coheſion of all bodies to fixed air. But fixed air is no more to be conſidered a part of animal ſubſtance than gluten. Laſtly, Dr. Cullen talks of the denſity and elaſticity of the moſt ſimple fibre, as well as its coheſion, depending upon the proportion of water to the other concreting matter (Inſtit. of Medicine). In a word, the ſame objections are to be made to Doctor Cullen's opinion, as to thoſe of Leber, Haller, Macbride, and others.

(5) Moſt phyſiologiſts agree, that the ſimple, ſolid fibre, like the line of the Geometer, conſiſts of points, differing, however, from each other, becauſe the points of the former are *phyſical*, but thoſe of the latter imaginary. Haller extends the allegory, and ſays that, the parts of

the

If many ſimple fibres be connected together, by their breadth, they conſtitute a *Simple Layer*, or *Lamina* (6).

Cellular texture is formed by the union of many ſimple *laminæ* (7).

When

the human body are made of fibres, as geometrical figures are made of lines. He ſays, that one Bernard Connor firſt taught that the whole animal body is made of fibres, more or leſs compacted together; but he refers to Herman Boerhaave, and his pupils, for the particular proof of ſuch conſtitution in Bones, Cartilages, Membranes, Veſſels, Ligaments, Tendons, Muſcles, Nerves, Cellular Membrane, &c. (*Elem. Phyſiol. Tom.* I.).

It may be remarked alſo, that this is not the only meaning of the word *Fibre*; ſince Celſus, ſpeaking of the Lungs, talks of their *Fibres*, where we would ſay, *Lobes*. His words are,—"*in duas fibras, ungulae bubulae modo, dividitur*;"—underſtand *Pulmo* (*Lib.* IV. *Cap.* 1.)—The moderns, however, ſeldom, or never, uſe the term, to ſignify any thing different from that defined in the text. Thoſe who are deſirous to ſee the other ſignifications of this word, may find them in Voſſius's *Etymologicon Linguae Latinae*; and in Caſtellus's Lexicon.

(6) Though the word *Fibre* be generally confined to the ſignification of an extended, ſmall, body, the length of which much exceeds the breadth; yet Haller ſays,—"Another kind of fibres is the *laminae*"—(*Prim. Lin.* § VIII.). Now as he ſpoke of the ſimple fibre, or that which is conceived, but not ſeen, and which is thought to exiſt, incapable of being divided into leſs fibres; ſo by the ſecond kind of fibres, or the ſimple *laminae*, he does not mean the large ones of bones, but the ſmalleſt, perhaps, of the cellular membrane; or ſuch as cannot be divided into leſs.

(7) According to Haller, the cellular membrane is compoſed of both kinds of fibres; of fibres, as we commonly ſay, and of his ſecond kind, or *laminæ*. He further obſerves, that there is a greater number of fibres than *laminæ* in ſome parts; for example, the coat of the carotid

artery,

When cellular texture is more compact, it becomes a *membrane* (8).

The convolution of many membranes so as to form a canal, capable of containing the circulating fluids, suggests the idea of a *vessel.*

Thick, strong, and elastic membranes, are called *ligaments.*

Cartilage seems to be composed of a coagulated, elastic jelly, and a peculiar kind of fibre.

Bones are the most dry and hard parts of the human body: composed of fibres, which are insensible, firm, and fragile, together with an interposed terrestrial gluten, changed into coagulum.

Nerves appear to be soft bundles of fibres, arising by innumerable white, pulpy filaments, continued in a parallel direction; by the in-

artery, described by Lancisi, Hebenstreit, and others: whilst in some parts, such as the *epiphyses* of bones, and cellular membrane, the quantity of *laminæ* exceeds that of fibres.—I mention this, because it is the opinion of a great man; though I own myself ignorant of any good that can possibly arise from knowing it.

(8) So Haller thought, and said, that cellular substance is changed into membrane, by mere pressure; and that membrane again becomes cellular substance, by relaxation. He conjectured likewise, that tendons, cartilages, and every part of an animal is made of cellular membrane. It seems strange, how he could have inferred this of cartilage: but, he says, the cartilage of adult persons and children, especially that of their ribs, is gradually resolved into *laminæ*; that is, into his second kind of fibres: which, I imagine, Professor Leber means, by "*singularis fibrarum species.*"

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tervention of which, ſenſation and motion is performed.

Muſcles are organical parts deſtined for animal motion, compoſed of nerves, fibres, arteries, and veins.

Tendons are the beginnings or ends of muſcles, of a colour ſomewhat like that of ſilver; but, in the latter, the fibres are firmer, ſtronger, and nearer together.

Glands are organized parts, rather compact, round, or oblong, contained in a proper membrane, compoſed of arteries, veins, and nerves, and intended for the ſecretion or change of ſome determinate fluid.

Viſcera are organical parts, compoſed of veſſels, nerves, glands, ſecretory, and excretory ducts, cellular texture and membranes (9).

An *Organ*, or *organical part*, is any part of a living body, which performs a determinate office.

The Fluids of the Body.

Before the *fluid* parts of the human body are ſeparately examined, it will not be amiſs to premiſe a compendious ſurvey of the *Animal Oeconomy*.

As ſoon as food is taken into the mouth, divided by the teeth, and chewed and mixed with ſpittle and air, it is carried into the cavity of the *fauces* and *pharynx* by the action of the muſcles of the tongue, the *os hyoides*, &c. and from thence through the *oeſophagus*

(9) For more accurate definitions, and hiſtories, of theſe parts, the reader may conſult the ſequel.

into the ſtomach. But it is neceſſary that ſolid and fluid aliment, before it paſs into the hollow of the *pharynx*, ſhould be carried over the opening of the top of the *aſpera arteria*, which is ſituated before the *pharynx*: hence Nature hath ordained, that the *epiglottis* ſhall cover the *trachea*, and exactly cloſe it; ſerving, as if it were a bridge for meat and drink, paſſing over the aperture of the *trachea*; leſt they ſhould fall into it, and excite the danger of ſuffocation.

The food being carried into the ſtomach, and diluted with the ſaponaceous bile and pancreatic juice, is again attenuated and diſſolved by the fluids of the inteſtinal canal, and its periſtaltic motion. What is mucilaginous is diluted, and that which is oily is mixed with that which is watery; ſo that a white, milky liquor is at length extracted, which is called *Chyle*. This chyle is abſorbed by the very numerous beginnings ~~ends~~ [10] of lacteal veſſels, opening into the cavity of the ſmall inteſtines: the remaining thicker part of the aliment, from which the chyle has been abſorbed, being propelled into the large inteſtines, to be evacuated from the body through the *anus*, by the periſtaltic motion. The lacteal veſſels convey the chyle, which they have abſorbed, into the lymphatic glands of the meſentery; where it is attenuated and diluted by lymph, brought

(10) It will be found hereafter, that Leber had ſpoken more properly, if he had ſaid, *by the very numerous beginnings*, inſtead of *ends* (*à copioſiſſimis finibus*, &c.) of lacteal veſſels.

there

there from the inferior parts of the body. Out of theſe glands of the meſentery, the chyle is carried to the *Lumbar Ciſtern*, and laſtly to the *Thoracic Duct*: the ſuperior part of which is inſerted into the left ſubclavian vein, into which the chyle is poured from the duct already mentioned.

The chyle thus mixed with the blood, deſcends into the right ventricle of the heart; and is thrown out of it, together with the blood, by the contraction of this ventricle, into the trunk of the pulmonary artery, its branches and minute ramifications; which are diſperſed throughout the lungs. Then the chyle is intimately mixed with the whole maſs, partly by the action of the veſſels themſelves, and partly by the movement of the circulating blood: hence it is rendered fit to nouriſh the body by ſupplying the waſting of all the fluids, in the ſecretory organs.

Now the air of the atmoſphere, which is inſpired and expired alternately, by the mechaniſm of reſpiration, ſeems to conduce much to the completion of thoſe charges in the chyle and blood, which have already been mentioned. For, during inſpiration, air expands all the branches of the *bronchia*, and the air cells; and conſequently, the lungs are every way expanded, the blood-veſſels elongated, and their preſſure againſt one another leſſened: ſo that the blood circulates through them more freely. But, during expiration, the lungs become ſmaller and more contracted, all

all the veſſels are drawn into more acute angles, and are neceſſarily more compreſſed ([11]). The motion of the blood too, which before was free, now becomes ſlow and difficult, and continues ſo, till its greater accumulation in the right ventricle of the heart and trunk of the pulmonary artery obliges us to inſpire again. Hence it appears manifeſt, how neceſſary freſh portions of the moſt pure and wholeſome air are to the formation of blood,

([11]) Leber ſeldom differs in opinion from Haller, who alſo aſſerts that the blood veſſels of the lungs are elongated, their diameters enlarged, and their angles ſo changed, by inſpiration, as to render the circulation of blood through the lungs free; but that, in expiration, the lungs are contracted in all directions; and even that the angles of the blood veſſels become more acute, ſhorter, and of ſmaller diameter: ſo that the blood which before was freely moved, is now moved ſlowly and difficultly, or not at all, till forced by the pain, one is led to inſpire, to renew the dilatation of the lungs (Haller *Pr. Lin.* § CCLXV. or *El. Phyſ. Lib.* IV. *S.* 4.) Now this reaſoning is certainly fallacious. For though it be admitted, that the *bronchia* and blood veſſels of the lungs are extended in inſpiration, and contracted in expiration; as the lungs themſelves are alſo extended and contracted; though it be admitted, that an accumulation of blood do take place, on the right ſide of the heart, in expiration; from the ſlower circulation of blood through the pulmonary veſſels, yet Haller undoubtedly contradicts himſelf, by ſaying that the angles formed of the veſſels of the lungs are rendered more or leſs acute in the different ſtates of reſpiration, by alledging that the lungs are augmented or diminiſhed; but that their form continues the ſame. For it is as plain as any propoſition of Euclid's, that if the lungs be enlarged, or contracted in all dimenſions, the *bronchia* and blood veſſels will have the ſame *ratio*. (Goodwyn's Inquiry on Drowning, &c.)

and the confequent eftablifhment of health. Befide, there efcape from the blood of the lungs, in expiration, many volatile, watery and putrefcent particles. Laftly, air feems to contribute, in a great degree, to the red colour of the blood.

Blood, formed in the lungs, in the manner now defcribed, is a liquor feemingly homogeneous, of a red colour, and coagulable; becoming of a more glowing purple, as the body from which it is effufed is more healthy, and fupported with better nutriment [12]. This very

[12] Though Human Blood, moving in the arteries and veins, appears upon infpection to be a homogeneous fluid: yet, if viewed through a microfcope, it appears manifeftly to confift of red particles floating in a tranfparent, colourlefs *medium*.

Blood is more *Fluid* in the arteries than in the veins, and in the veins than in the right ventricle of the heart, the *corpora cavernofa* of man, the *clitoris* of woman, and perhaps the *finufes* of the brain.

As to its *Heat*, in man, it never exceeds 112°, and it is never lefs than 30°, of Farenheit's thermometer. But in different perfons, and in the fame perfon at different times, the heat of the blood is very different. The heat of the blood, and of man, is nearly the fame in fummer and in winter. Whatever quickens the pulfe, augments the heat alfo.

The *Colour* of the blood depends upon the red particles. The blood of the arteries being thinner, it is alfo more florid than that of the veins.

When blood is effufed from the veffels of a living body, and received into a bafon, it begins after three or four minutes to coagulate, and in feven or eight minutes it is entirely coagulated. There is, however, fome variation in the time of coagulation; it always takes place the fooner in proportion as the action of the blood

very blood, is brought back by the pulmonary veins into the left ventricle of the heart; from

blood veſſels is the ſlower, and as the perſon, from whom it is effuſed, is the weaker.

Blood always coagulates in the veſſels of dead bodies, ſooner or later, according to the circumſtances of dying: except in certain caſes of very ſudden death, from lightning, electricity, a blow on the ſtomach, &c. Animals killed in the chaſe have their blood not coagulated.

The quantity of blood in an animal body is difficult to be aſcertained. Moſt phyſiologiſts agree that, in an adult, the quantity is nearly equal to thirty pounds; and that the ſum of all the circulating fluids is at leaſt equal to fifty pounds. So that the quantity of fluids in an animal body is far greater than of ſolids. The quantity of blood effuſed is not ſo much the cauſe of fainting and of death, when fainting and death follow a loſs of blood, as the manner in which the blood flows. For, if it flow ſlowly, and from a ſmall orifice, it is ſurprizing how much blood may be extracted, without fainting: but, on the contrary, if blood flow quickly, and from a large orifice, faintneſs ſupervenes while the quantity effuſed is but inconſiderable; and, if a large quantity of blood be very ſuddenly withdrawn, death is the inevitable conſequence. This, which is ſo eaſily put to the teſt of experiment on brutes, depends upon the neceſſity which there is for the blood-veſſels to accommodate themſelves to their contents. And, it is impoſſible for the blood-veſſels to contract and adapt themſelves to their contents, if their contents be ſuddenly decreaſing. For a certain plenitude of the veſſels is neceſſary to keep the functions of life entire, and to preſerve health. Hence, if we would induce faintneſs, to ſtop hæmorrhages, and to leſſen and deſtroy inflammation, we ſhould let blood by a large orifice.

In about ten, or eleven, minutes, the blood being coagulated, a fluid oozes from every part: the jellied or coagulated part contracts, and recedes from the ſides of the veſſel, and after ſome interval, is ſurrounded by the fluid ſeparated from it. The coagulated part, or *Craſſamentum*, is nearly equal in bulk to the fluid in which it is

from whence, it paſſes into the *aorta*, and from the *aorta*, to every part of the body; where

is immerſed; but in ſtrong perſons the proportion of *craſſamentum* to the fluid part, or *ſerum*, is greater than in weak perſons (See Cullen's Mat. Med. Vol. I.)

This ſeparation into *craſſamentum* and *ſerum* is retarded, and prevented by cold. Cold alſo impedes and prevents the coagulation of blood. Mr. Hewſon cauſed blood to freeze, whilſt contained in the veins; and he found that, when thawed, it jellied and ſeparated into *craſſamentum* and *ſerum*, as if it had never been frozen (An Experimental Inquiry into the Properties of the Blood, Exp. V. Edit. 2.). He alſo found by experiment, "that the ſeparation of the blood in a given time, is in proportion as the heat in which it ſtands is nearer to the animal heat, or 98°, or greater in that heat than in any of a leſs degree (p. 5.)."

Serum, ſeparated ſpontaneouſly from the reſt of the blood, is fluid in the heat of the atmoſphere, tranſparent, yellowiſh, and in ſpecific gravity to water as 1030 to 1000 (Dr. Jurin's Exper. Philoſ. Tranſ. N° 361.). Its taſte is ſaltiſh.

It coagulates at 160°, and when coagulated, it reſembles the white of an egg. The gaſtric liquor coagulates *ſerum*: Acids, Alkohol, and Eſſential Oils coagulate it. But none of theſe, when taken by the mouth, paſſes ſo concentrated into the blood-veſſels as to coagulate the blood in them.

If *ſerum* be expoſed to a heat below 160°, but equal to 100°; it is gradually inſpiſſated into a browniſh, ſolid maſs. And, if the fluid evaporated be condenſed, collected, and added to the inſpiſſated *ſerum*, it will diſſolve it, and form fluid *ſerum* again; poſſeſſed of all its former properties. If, inſtead of the fluid collected by diſtillation, water be added to inſpiſſated *ſerum*, the ſame follows.

If *ſerum* be diluted with water, it is not coagulable at 160°, nor at 212° (Hewſon, p. 138.). But if the mixture be evaporated, coagulation begins as ſoon as the ſuperfluous

where different liquors are ſeparated from it, according to the various nature of the parts and

ſuperfluous water is exhaled; a pellicle being formed on the ſurface, which becomes thicker by degrees as the evaporation is continued. This pellicle cannot be diſſolved in water, like inſpiſſated *ſerum:* Mr. Hewſon ſays, it ſeems to be a mucilage coagulated.

If we preſs *ſerum* coagulated by heat, a fluid eſcapes from it, which Senac calls *Serocity (Traité du Cœur.).* The ſalts of the blood are ſaid to be contained in this ſerocity. Serocity is not coagulated at 212°, unleſs a part of its water be evaporated.

If it were not for the ſalts of the *ſerum*, it would probably congeal, as water does, at 32°. But *ſerum* congeals only at 28°.

Craſſamentum conſiſts of two parts, eaſily ſeparable from each other, viz. what is called the fibrous part of the blood, or *Gluten*, or *Coagulable Lymph*, and red particles.

To effect the ſeparation of theſe two, from each other, one needs only to waſh the *craſſamentum* with water; for during the waſhing, the red particles will be carried away, and the coagulated lymph will remain behind.

Coagulable Lymph, as long as it continues in circulation, is fluid at any degree of heat between 30° and 120°. Its point of coagulation is, perhaps, between 114° and 120½. It cannot be coagulated by diſeaſe, for febrile heat never exceeds 112°.

Some have imagined that coagulable lymph and *ſerum* are the ſame; becauſe if mixed with ſome of the neutral ſalts, coagulable lymph does not coagulate in the temperature of the atmoſphere. But Mr. Hewſon found that coagulable lymph mixed with Glauber's ſalt, coagulates at 125°, whereas *ſerum* does not coagulate, except at 160° (Hewſon, Exp. VII.). Coagulable Lymph, even if mixed with a neutral ſalt, cannot be inſpiſſated, and diſſolved again, without coagulation (Hewſon, p. 137.). The ſmaller the veſſel, from which coagulable lymph is taken, the longer it is in coagulating.

Whenever

and *viſcera*. Of theſe ſecreted liquors, thoſe that are uſeleſs are evacuated from the body; but

Whenever the action of the blood-veſſels is quick and ſtrong, the blood is rendered more fluid and flow of coagulating. Faintneſs and languor, which render the blood more viſcid, increaſe its tendency to jelly. Hence, when the vaſcular ſyſtem is much excited, and when the coagulable lymph is attenuated, and its tendency to coagulate is leſſened, the red particles have longer time to ſubſide, through it; and, accordingly, the coagulable lymph appears free from red particles, and coagulated on the ſurface of the *craſſamentum*. If the blood of a pleuritic perſon be continually agitated till it is coagulated, the coagulable lymph will not be ſeparated from the red particles; conſequently, there will be no coagulable lymph on the ſurface of the craſſamentum.

Patients labouring of inflammatory diſorders have the coagulable lymph very much attenuated: of conſequence, when their blood is expoſed to the air, the thinneſs of the lymph, and its ſlowneſs of coagulating, allow the red particles to ſink to the bottom of the veſſel. The coagulated lymph, thus freed from red particles, on the ſurface of the blood of patients having inflammatory diſeaſes, is called the *Cruſt*, *Size*, or *Buff*, of the blood.

It is the coagulable lymph, which, when ſolid, gives firmneſs to the *craſſamentum*.

The Cauſe of the Coagulation of the Lymph, when affuſed into a baſon, is not known. It has been attributed to reſt. But if you agitate blood with a ſtick, it will coagulate. Mr. Hewſon attributes it to the Air (p. 20, 21.); but when blood is effuſed into the cellular membrane, it coagulates, forming *ecchymoma*. It coagulates alſo in dead bodies. Another cauſe, and to which it has been aſſigned, is cold. Cold certainly thickens the blood, but it leſſens its diſpoſition to coagulate; and, if long continued, altogether prevents it. Mr. Hunter believes the blood to be alive, and conſiders its coagulation as depending on its life.

Red Particles. The red particles of the blood were ſo generally allowed to be ſpherical, before the time of our

but the uſeful ones, and thoſe that are requiſite for nutrition and the purpoſes of the animal œconomy, are retained.

The

our countryman Mr. Hewſon, that in almoſt all books on the blood, they are called *Globules*. Mr. Hewſon, however, ſays, they are as flat as a guinea, and have a dark ſpot in the middle, which ſpot was miſtaken by Father de la Torré for a hole. Mr. Hewſon, the better to aſcertain the figure of the red particles, coloured a quantity of *ſerum* with a piece of the *craſſamentum*, and ſpread a little of the coloured *ſerum* on a thin glaſs plate. And he ſays, that, when this thin glaſs plate is placed horizontally in the microſcope, but ſomewhat higher at one end than at the other, the red particles will deſcend from the higher to the lower part of the glaſs plate, together with the *ſerum*, ſome gliding along on their flat ſides, and others turning from one ſide to the other. The celebrated Senac ſays, the particles of the blood are lenticular (*Traité du Coeur)*.

Mr. Hewſon believed the black ſpot to be a ſolid particle. For having dropped a drop of blood on a thin glaſs plate, and added drops of water to it, he ſaw that, in proportion as he added water, the particles became more ſpherical, their longeſt diameter was ſhortened; and, as they rolled, the ſolid middle particles were diſtinctly ſeen falling from ſide to ſide in the hollow veſicle, like a pea in a bladder. Sometimes he ſaw the particles ſticking to one ſide of the veſicle.

As the red ſolid particle occupies the middle only, the edges, according to Mr. Hewſon, are either empty, or contain a ſubtile fluid. Mr. Hewſon ſaw the veſicle burſt, and the red particle fall out of the fiſſure.

That the uſe of the ſalts of the blood is to preſerve the figure of the veſicles, to keep the blood fluid, and fitter for circulation, is deduced from the effects of water, which changes the figure of the veſicles, renders them thinner and more tranſparent, and at length diſſolves them.

The

The Chemical Principles of the blood are a volatile watery phlegm, coagulable lymph,

The ſize of the red particles, veſicles, or globules, or whatever they are, is ſaid by Dr. Jurin to be about the 2000th part of an inch (Phil. Tranſ. No. 361), and by Haller to be between the 2000th and 3000th part of an inch (*Primae Lineae Phyſiologiae* § 145). But Hales and Senac have thought it much leſs.

There are more red particles in ſtrong than in weak animals.

The opinion of Lewenhoeck, and of Boerhaave (*Inſtitut. Med.* § 226.) was, that the red particles are globular. They averred that each red globule is compoſed of ſix yellow ſerous globules; and that each yellow ſerous globule is compoſed of ſix pellucid lymphatic globules. So that, according to them, each red globule is formed of thirty-ſix lymphatic globules. Gaubius very properly objected to this opinion: he could not imagine how ſix yellow globules can make one red one (*Inſt. Pathol.* § 341.). I believe this opinion is now-a-day totally laid aſide; but it deſerved to be mentioned, as being the foundation of Boerhaave's ſyſtem.

Dr. Hales found that thirty-three parts of the blood are true air (Veget. Stat. Exp. 49.). But he ſeparated this air by diſtillation. Therefore, it affords no proof of air ever being looſe and uncombined in the blood-veſſels. Indeed it is certain there is no air floating in the blood: ſince, if you puncture an artery, or a vein, under water, not a particle of air eſcapes and aſcends (Philoſ. Tranſ. 1774.).

The blood is ſometimes of a milky appearance. This the older phyſiologiſts had aſſigned to unaſſimilated chyle: Mr. Hewſon derives it from the abſorption of oil out of the cellular membrane (Exp. Inq. Part I. p. 141.); and his chief reaſon is, becauſe in diſſecting geeſe, the chyle of which is tranſparent, he often ſaw the ſame. But as this appearance may ſo very often be ſeen in blood drawn ſoon after eating; and as animal oil ſinks in *ſerum*, and does not ſwim, like chyle, it ſeems to me that the older opinion is right (note 455.).

oil, alkali both fixed and volatile, marine salt, alkaline earth, together with a large quantity of air, and a little iron [13].

The principal liquors separated from the blood are these: viz.

a. *Earwax*, in the Ears.

b. *Tears*, in the Lachrymal Gland.

c. *Spittle*, in the Salival Glands of the Mouth.

d. *Mucus*, in the mucous glands of the Nose, Mouth, Intestines, *aspera arteria*, &c.

e. *Gastric Liquor*, which is analagous to spittle, in the Stomach.

f. *Bile*, in the Liver.

g. *Pancreatic Liquor*, which is like spittle, in the Pancreas.

h. *Urine*, in the Kidneys.

i. *Seed*, in the Testicles.

j. *Fat*, in the Adipose Membrane, and particularly, the *Omentum*.

k. *Synovia*, or the *Haversian Liquor*, in the Joints.

l. *Milk*, in the Breasts; which differs not from Chyle, except in being more elaborated.

m. *Perspirable Matter*, *Sanctorian*, *Perspirable*, or *Insensible Transpirable Matter*, in the skin. When this is more sensible, or in greater plenty, it is called *Sweat*.

[13] The Chemical Analysis of the Blood, as well as of the fluids separated from it, shall be given at large in another work, if nothing prevent it. But the natural history of the fluids mentioned in the text shall be given in their proper place; viz. Of Earwax, in the chapter on the Ear; of the Tears, in the chapter on the eye, &c.

O S T E O L O G Y.

OSTEOLOGY is that part of Anatomy which explains the doctrine of the Bones. Bones are confidered either when free from all the furrounding foft parts, or when fome of the foft parts are preferved and connected with them.

Ofteology, therefore, is divided into *Dry* and *Recent*. We fhall treat of the former, at prefent, poftponing the latter, becaufe the time, allotted for teaching this fubject, requires it.

The *Object of Ofteology* are Bones, whether taken apart, or dry, and joined together artificially; or when recent, and connected by their natural ligaments, as well in the infant, as the adult ftate.

Now, a *Bone* is defcribed as the hardeft, moft compact, moft inflexible, and moft infenfible part of the body (14), formed of many

(14) Confult the Recent Ofteology.

ſmall *lamellae*, which are themſelves formed of rigid fibres, placed very cloſely againſt one another, in a certain manner.

When the *Elements of Matter* are placed next one another, in a longitudinal ſeries, *bony fibres* are made. When bony fibres, like theſe, are adapted one to another laterally; they conſtitute *bony lamellae*; between which a gluten is effuſed, and gradually coagulated. The *Formation of Bones* conſiſts in theſe circumſtances. That ſpot, in which the formation of bone is firſt evident, is called the *Point of Oſſification.*

Bones are neither formed of membranous nor of cartilaginous fibres, but of thoſe earthy particles which always conſtitute the fibres of bones, and not the ſofter ones of cartilage, tendon, muſcle, &c.

The *Lamellae* which are formed, differ one from another, in length, breadth, and thickneſs, and in levity and ſtrength, according to the different poſition and number of bony fibres, concurring to make them. Theſe *lamellae*, placed one over another in layers, are alſo conjoined by means of very numerous, irregular eminences, and lateral proceſſes ([15]), which

([15]) I have here tranſlated *Claviculi*, *Little Proceſſes*, after the example of Dr. Monro, (Anat. of the Human Bones). Theſe ſmall proceſſes, which Gagliardi firſt thought of, and called *Claviculi*, as I ſuppoſe, to render his hypotheſis eaſy, are ſaid by him to be readily diſco-vered

which arife from the furface on both fides. The diverfity of bones, and their threefold fubftance, may be deduced from this ftructure.

Bones differ one from another not only in length, but alfo in figure. Some are long, and others are fhort: fome are cylindrical, fome flat, crooked, round, poffeffed of angles, or having a form altogether indeterminate. Befides, there are eminences, depreffions, furrows, and cavities, in the furface of bones; and the laft of thefe are prefent in the *meditullium* of moft bones.

There are two kinds of *Eminences*, the one is called *Apophyfes*, and the other *Epiphyfes*.

By the name *Apophyfes*, or *Proceffes*, is underftood, prominences continued from various parts of bones, which grow together with the bones, and are not feparable from them by boiling.

Epiphyfes are eminences attached to the ends, or fides of bones, by means of *periofteum* and cartilage; for which reafon *epiphyfes* are feparated from bones by boiling. In infants the *epiphyfes* adhere loofely: they are

vered in the bones of the *cranium*, after their being boiled, burned, or expofed to the open air a long time. He diftinguifhed them, according to their direction, into *perpendicular* and *oblique*, and from their figure into *capitati*, or *headed*, and *ad angulum retorti*, or crooked. (*Anatome Offium Novis Inventis Illuftrata. Cap.* 1. *Obf.* 2.). Malpighi thought him miftaken; and modern anatomifts think as Malpighi did.

ſoft, and ſomewhat of the ſame nature as cartilage ([16]).

Prominences, like theſe, are variouſly denominated, according to their figure, ſituation, direction and uſe.

Proceſſes extended from the end of a bone, if ſmooth and round, are called *Heads:* but they are called *Condyles*, when flattened, either above, or laterally. That part, which is beneath the head, and which exceeds the reſt of the bone in ſmallneſs and levity, is called the *Neck*. Rough, unequal proceſſes are called *Tuberoſities*, or *Tubercles*; but the longer and more acute are called *Spinous*, or *Styloid Proceſſes*, from their reſemblance to a thorn. Thin, broad proceſſes, with ſharp extremities, are known by the name of *Criſtae*, or *Sharp Edges*. Other proceſſes are diſtinguiſhed by their form, and called *Alar*, or *Pterygoid*, *Mammillary*, or *Maſtoid*, *Dentiform*, or *Odontoid*, &c. Others, from their ſituation, are called *Superior*, *Inferior*, *Exterior*, and *Interior*. Some have their name from their direction, as *Oblique*, *Straight*, *Tranſverſe*, &c. And ſome from their uſe; as *Trocanters*, or *Rotators*, &c. &c.

Furrows, Depreſſions, and Cavities, are deſtined either for the reception of contiguous bones, to form an articulation with them,

([16]) *Epiphyſes*, therefore, become a kind of *Apophyſes* by age. Kulm relates the caſe of the body of a girl that he diſſected, in which, though ſhe had paſſed the ſixteenth year, all the *epiphyſes* were ſeen connected by cartilage. (*Tab. Anat. p.* 62.).

when

when they are called *Articular Cavities*, which are fometimes deeper and fometimes fhallower; or they receive hard parts, but do not conftitute a joint with them.

Moreover, cavities ferve for the tranfmiffion and attachment of foft parts.

Various names are given to depreffions and cavities, according to the magnitude and figure of bones. If they be broad and large at the beginning, and not deep, but contracted at the end, they are called *Pits*. *Furrows* are open canals extending longitudinally in the furface of bones. A hollow, circular tube, for the moft part of the fame diameter, from beginning to end, and more or lefs crooked, ftraight, long, or fhort, is named a *Canal*. *Foramina* are the apertures of canals, or they are formed of the excavated margins of two bones, placed againft each other. If fuch be the form of the margin of a bone, as if a portion were taken out of it, we call it a *Notch*, or *Scollop*.

Befides thefe, there are mucilaginous cavities and labyrinths in bones, which we fhall fpeak of on another occafion: but it is not worth while to take particular notice in this place of thofe unequal parts of bones, called *Inequalities*; though fome authors have done it.

The *Colour* of dry bones depends on the fkill of the preparer. They are fometimes very white, and fometimes inclining to yellow. What relates to the natural colour of the recent bones, compared with one another, and confidered according to

 the

the diverſity of age, will be ſpoken of in a more fit place, the *Recent Oſteology.*

The *Subſtance* of bones is of two kinds. If the fibres and *lamellae* cohere very firmly, and are placed one upon another, the ſubſtance is more compact, denſe, and firm; and it is this ſubſtance that conſtitutes the external part of every bone. It is moſt plentiful in the middle, or body of cylindrical bones; leſs plentiful in the extremities; and it encompaſſes the greater part of flat bones with a thin coat: but, where the interſtices are more remarkable and intercepted by thoſe fibres and *lamellae*, or where particular cavities are formed, there the ſubſtance of bones is rarer. This rarer ſubſtance of bones is alſo of two kinds; for when the fibres ſeparate from the bony *lamellae*, they are bent and interwoven one with another, in various directions, ſo as to reſemble a kind of ſponge, called *Cellular*, or *Spongy Subſtance.* Another kind of ſubſtance is the *Reticular.* This is found in the *meditullium* of cylindrical bones, and is made up of ſmall, long, bony fibres, which intercept manifeſt interſtices, decuſſate one another, and conſtitute a kind of net-work.

Thus, the longer bones conſiſt of three kinds of ſubſtance; of which the firſt is denſe, firm, and *compact*; the ſecond is *cellular*, or ſpongy; and the laſt is *reticular.*

Internally in bones, there are large cavities, ſmall receptacles, cells, and different *foramina.*

The larger cavities may be ſeen throughout the whole length of cylindrical bones; in which the compact ſubſtance is turned into a long and great canal. There are cells in all bones, either long or ſhort, circular, oval, &c. As to *foramina*, they are the orifices of canals, or they are as ſmall as the pores of the ſkin.

If all the bones proper to the body be joined together, in the natural order, they form a *Skeleton*. When the bones are connected by wire, the ſkeleton is ſaid to be *artificial:* it is called a *Natural Skeleton*, when, inſtead of metallic means, the bones are preſerved in their proper place by the natural ligaments (17).

A *Skeleton* is divided into three parts; viz. its *Head*, its *Trunk*, and its *Extremities*.

The *Head* is compoſed of the Skull and the Bones of the Face.

The Skull is made up of eight bones, the foremoſt of which is the *Os Frontis*; the hindermoſt the *Os Occipitis*. The two *Oſſa Parietalia* form the ſuperior lateral parts; and the

(17) Each of theſe Skeletons has its particular uſe; both being neceſſary in teaching and learning Anatomy. The *Artificial Skeleton*, if rightly prepared, ſuffers no change by being kept, deſtructive of its original form, or productive of inconvenience: but the *Natural Skeleton* loſes its form, and is only uſeful whilſt freſh. For, in keeping it a long time, the marrow, and other parts, diſpoſed to ſpontaneous change, exhale an odour alike ungrateful and unwholeſome, and exude a greaſineſs irreconcileable to the touch. Moreover, the ligaments and cartilages become dry, ſhrink, and loſe their original figure; and even hide parts which ought to be ſhewn. Laſtly, the colour of freſh bones is changed by keeping them.

two *Offa Temporalia*, the inferior lateral parts. Under the anterior part of the *Os Frontis*, is placed the *Os Ethmoideum*; and under the inferior part the *Os Sphoenoideum*.

The four little bones of the Ear are contained in the petrous portion of the *Offa Temporum:* their names are *Malleus*, *Incus*, *Stapes*, and *Officulum Orbiculare*. There are alfo frequently, between the futures of the *cranium*, fmall bones, called *Triquetra*.

Anatomifts divide the *Face* into the *Upper* and *Under Jaw*. The Upper Jaw confifts of thirteen bones; two *Offa Maxillaria*, two *Nafalia*, two *Lachrymalia*, two *Jugalia*, two *Palatina*, two *Spongiofa Inferiora*, and the *Os Vomer*.

The Under Jaw of an adult is only one bone.

The Face, therefore, confifts of fourteen bones, fix of which are pairs, two are not.

Thirty-two Teeth are naturally implanted in both jaws, fixteen in each.

The head, therefore, contains fixty-two bones, as appears from adding them all together. And, if the *Os Hyoides* be enumerated with them, the head is compofed of fixty-three bones.

All the bones are referred to the trunk, except thofe of the head, and thofe of the fuperior and inferior extremities; fo that it confifts of the *Spine*, *Thorax*, and *Pelvis*. The Spine is fubdivided into its twenty-four *True Vertebrae*, viz. feven of the neck, twelve of the back, and five of the loins.

The

The *Pelvis* is composed of four bones; viz. the two *Ossa Innominata*, the *Os Sacrum*, and the *Os Coccygis*. The two latter are distinguished by some, under the name of *False Vertebrae*.

The Thorax is made up of twelve ribs, on each side; the seven superior of which are called *True Ribs*, and the inferior five, *False*; all of them being fastened to the *vertebrae*. Anteriorly, is the *Sternum*, which consists of two parts, together with the annexed *Xyphoid Cartilage*, at its inferior extremity. Hence, the *thorax* consists of twenty-six bones, and the entire trunk of fifty-four.

There are four extremities. Two *superior*, which are connected to the sides of the *thorax*; and two *inferior*, affixed to the lower part of the *ossa innominata*. The former are called *Arms*; the latter *Legs* and *Thighs*.

The *Superior Extremities* are divided into

1. The *Shoulder*, which is composed of the *Scapula* and *Clavicle*:

2. The *Arm*:

3. The *Fore-arm*, which is formed of the *Radius* and *Ulna*:

4. The *Hand*, consisting of the *Carpus*, *Metacarpus*, and the five Fingers.

The *Carpus* is composed of eight little bones: viz. the *Os Naviculare*, *Os Lunare*, *Os Cuneiforme*, *Os Pisiforme*, *Os Multangulum majus*, *Os Multangulum minus*, *Os Magnum*, *Os Unciforme*.

The

The *Metacarpus* conſiſts of five bones only.

The *Five Fingers* are made up of fourteen bones, two of which belong to the thumb; and there are three which concur to form each of the four fingers: viz. the *Fore*-finger, the *Middle*-finger, the *Ring*-finger, and the *Little*-finger. The ſeries of bones belonging to each finger, is diſtinguiſhed by the appellation of a *Phalanx*. Beſides the bones already mentioned, there occur almoſt always two little bones, between the firſt bones of the *metacarpus* and the thumb, called *Seſamoidea*, which are ſometimes found in the hand, but ſeldom, if ever, between the *Os Femoris* and *Tibia*.

The number of bones then belonging to the ſuperior and inferior extremities being the ſame; the entire number belonging to the Skeleton of an Adult, as appears from what has been ſaid, is as here repreſented:

The Bones of the	*Head*, together with the *Os Hyoides*	63
	Trunk	54
	Superior Extremities	64
	Inferior Extremities	64
	The whole	245

The *Uſe of the Bones* is, to ſerve for the defenſe, direction, and ſupport of all the parts of the body.

The

The *Connection of Bones* is illuſtrated in the two following tables. The connection of bones being either *moveable* or *immoveable*, the one table repreſents the *moveable connections*, the other the *immoveable connections*.

TABLE I.

Moveable Connections of Bones (18).

ARTICULATION is a moveable connection of bones, when two bones joined together may be moved *to* and *from* each other.

I. Ar-

(18) All agree that a knowledge of the different kinds of articulation is a neceſſary part of Anatomy. Some, nevertheleſs, diſſuade perſons from it, by alledging that it is diffuſe, complicated, and, conſequently, difficult to be attained. I have never been ſo unlucky as to labour under any perplexity in acquiring it; and am perſuaded that the difficulty complained of by others, aroſe from their fearfulneſs to attempt, or officiouſneſs to condemn. The following tables illuſtrative of the manner in which the various conjunctions of bones are made, are compendious, full, and clear. They differ, indeed, from thoſe which Leber had given; but the difference is ſmall, and ſerves one good end, which is, to prevent the repetition of the ſeveral examples which muſt otherwiſe have neceſſarily been made.

Profeſſor Leber conſiders an articulation as the union of the extremity of one bone to the extremity of another; whether the two bones can be moved upon each other, or not. He divides the moveable connection into three kinds: viz. *Diarthroſis*, where there is obvious motion; *Synarthroſis*, where there is obſcure motion;

I. Articulation with ſenſible motion is called *Diarthroſis.*

There

tion ; and *Amphiarthroſis*, where the motion is imperceptible.

Diarthroſis is ſubdivided into *Enarthroſis*, in which the great head of one bone is received into, and moved in the deep cavity of another : for example, the head of the *Os Femoris* in the *Acetabulum* : *Arthrodia*, when the round head of a bone is received into a cavity of leſs depth ; e. g. the Head of the *Os Brachiale* into the cavity of the *Scapula* ; and *Ginglimus*, where the bones receive and are received by each other, and when their motion is reciprocal on each other. *Ginglimus* is again divided into *Angular*, when one bone in moving makes an angle with another ; e. g. the *Ulna* with the *Os Humeri* ; and *Lateral Ginglimus* where the motion is lateral, as it is between the *Radius* and *Ulna*, or the firſt and ſecond *vertebrae* of the neck. The motion in *Ginglimus* is like that of a hinge.

We have an inſtance of *Synarthroſis*, between the Carpal and Metacarpal, and the Tarſal and Metatarſal bones.

Amphiarthroſis is ſuch motion as occurs between the bones of the *Carpus* or *Tarſus*.

So much for Articulation with motion. We come next to ſpeak of articulation without motion, which is called *Symphiſis*.

The firſt diviſion of *Symphiſis* by Prof. Leber is, into *Mediate*, in which there is ſcarcely any motion, but where ſomething is included between the bones ; and into *Immediate*, where nothing is interpoſed, but where the connection is firm and incapable of motion.

Mediate Symphiſis is called *Synchondroſis*, if cartilage be interpoſed ; e. g. the ribs and the *ſternum* : *Synneuroſis*, or *Syndeſmoſis*, or *Syntenoſis*, or *Synmenſis*, if Tendon or Ligament ; e. g. between the *Os Sacrum* and *Os Coccygis* : and *Syſſarcoſis*, if bones be united with muſcle ; e. g. the *Os Hyoides* with the *Sternum*, or the *Scapula* with the ribs.

Immediate

There are three kinds of Diarthrosis: viz.

1. *Enarthrosis*,
2. *Arthrodia*,
3. *Ginglimus*.

Ginglimus is again distinguished into *Angular* and *Lateral*.

II. Articulation with obscure motion is called *Synarthrosis*.

III. Articulation with insensible motion is called *Amphiarthrosis*.

Immediate Symphisis is called *Harmony*; e. g. between the bones of the nose: or *Suture*, which is *true* or *false*, as in the bones of the head: or *Gomphosis*, when one bone is fixed in another, as the teeth in their *alveoli*.

Here the doctrine of the Connection of bones is rendered easy. Those who are desirous to learn it, as described by others; or, to learn the different acceptations of the words above cited, must not wonder if they should find authors differing, and giving meanings to terms, which Etymology does not authorize. It is for this reason, that I have refrained from adducing the Etymology of the connections; for after inquiring into the proper meanings, and consulting antients and moderns, I was convinced that it was not only unnecessary, but improper; because it would frustrate my original design, which was to be short and easy.

TABLE II.

Of that Articulation of Bones, which is without Motion.

I. *Symphiſis*	*Mediate*	*Synchondroſis*	
		Syneuroſis	
		Syſſarcoſis	
	Immediate	*Harmony*	
		Suture	*True*
			Falſe
		Gomphoſis.	

The Bones of the Head.

We have already divided the head, which is the uppermoſt part of the ſkeleton, ſupported by the firſt *vertebra* of the neck, into the *Skull* and *Face:* and we have likewiſe enumerated all the bones, of which the head is compoſed, in proper order.

As to the *Figure of the Skull* (19) it is like an irregular, hollow ſphere, arched anteriorly, and

(19) The ſkull of an infant is more like a ſphere than that of an adult. The reaſon of which is obvious. Its form depends altogether on the equal and uniform preſſure of the brain, on the bones of the ſkull not being oſſified, and the muſcles contiguous to them not having acted. For, as the bones of the ſkull become firmer, the enlargement of the brain is more counteracted; and as the ſtrong

and on its upper and poſterior parts. It is flattened on each ſide, and is ſmooth but unequal on its under part. It conſiſts of the eight bones of the *cranium*. The bones of the face rather reſemble a triangle.

The *Magnitude of the Head*, in a well formed man, is in proportion to the reſt of the body as One to Nine ([20]).

It

ſtrong muſcles of the Temples are made to act more, ſo the temples are more flattened.

But, independent of theſe natural cauſes, which prevail in all perſons, Dr. Camper has endeavoured to prove that there are others, though unknown at preſent, which effect ſome characteriſtic mark in the configuration of the ſkulls of different nations. I believe, Veſalius was the firſt who made mention of this circumſtance. Inſtead of attributing it to certain unknown natural cauſes, he thought it depended on a peculiar management of the heads of children, in early infancy. He imagined that the Head of a Turk was more ſpherical, and that of an Engliſhman more flattened; becauſe the former had worn a Turban, and the latter a Chin-ſtay (*De Humani Corporis Fabrica. Lib. I. Cap.* 5.). It is hard to ſettle this matter, we leave it therefore for the diſcuſſion of others. There is ſomething, however, that diſtinguiſhes the head of a Negro from that of an European, which cannot be referred to any early preſſure; but muſt depend on cauſes of which we are ignorant, and perhaps ſhall always remain.

([20]) The head of a *foetus* differs from that of an adult, both in its proportion to the reſt of the body, and its figure. Hervey obſerved that the head of a *foetus* is larger than its whole body. Haller ſays the ſame (*Primae Lineae Phyſ.* § 889.). Ruyſch ſays that, about a month after conception, the entire man is ſcarcely any thing except head and tail (*Theſ. Anat.* VI. *Tab.* II. *Fig.* I.): and Blumenbach ſays, that the lower jaw and ſome of the bones of the face begin to be formed about the

 ſeventh

It deſerves attention, that of the different parts of the head, the ſuperior and middle part is called *Vertex*; the inferior part, *Baſis*; the two anterior, lateral and flat parts, *Temples*; the anterior part, the *Face*; the poſterior part, *Occiput*.

The *Subſtance of the* bones of the *cranium* is made up of two layers, or, a double, firm, and compact ſubſtance; the exterior of which is thick, ſmooth, and covered with *pericranium:* the interior layer is thin and unequal, but ſtronger than the former, and covered with *dura mater*. This latter *lamina* is called the *Vitreous Table of the Skull.*

Between the two tables, or *laminae* now deſcribed, there is a cellular ſubſtance, replete with a medullary fluid, like the ſpongy ſubſtance of other bones: but this is not preſent in different parts of the ſkull, and is ſometimes altogether wanting in aged perſons. Hence, the thickneſs of the ſkull is not every where the ſame; a circumſtance peculiarly worthy to be remembered by ſurgeons, in the operation of trepaning.

In Infants, the *Oſſa Parietalia* and the *Os Frontis* do not coaleſce till the third year; but the interſtice, which is obvious enough, is filled up with a ſtrong membrane, called the

ſeventh or eighth week after conception (Inſtit. Phyſ. § 634.).

At birth, the head is nearly one third of the whole body; but it becomes leſs in proportion as the child becomes older.

Fon-

Fontanella or *Fons Pulſatilis* (21). Moreover, it is to be remembered, that the various bones of infants, ſoon after birth, are generally compoſed of many parts, and that theſe parts gradually unite, in the progreſs of growth.

The Head, if we reſpect the moveable articulation of its bones, is connected with the firſt *vertebra* of the neck, by *Ginglimus*; and with the lower jaw, by *Arthrodia*. All

(21) It is alſo called *Fontanella Anterior* (Roederer, *Elem. Artis Obſt.* § 78.), to diſtinguiſh it from the *Fontanella Poſterior*, or *Occipital Fontanella* (Neſbitt's Human Oſteogeny, page 43.). In a foetus, the place of the bones of the ſkull being ſupplied by the *dura mater*, and a membrane which in the adult is called *pericranium*, we are enabled to diſcover the beginning of oſſification between theſe membranes, and to mark their ſeparation from each other, as effected by the newly formed bone. Such is the manner in which the bones of the ſkull are formed, and conſequently the *fontanellae*. If the bones of the ſkull were completely oſſified before birth, one very great inconvenience muſt neceſſarily occur; which is, that the head would not admit of compreſſion, during labour. But Nature has wiſely ordained that the bones of the ſkull ſhall not be perfectly formed till after birth: and ſhe has been equally provident in cauſing the quicker oſſification of the poſterior angles of the *oſſa parietalia*, and the ſuperior angle of the *os occipitis*, to obliterate the Occipital *fontanella*, and prevent the inconvenience of preſſing the *cerebellum*; which is perhaps attended with more danger than compreſſing the brain (Morgagni, *Adverſaria Anat.* II. *Animad.* 32.). Moreover, the ſkull is ſometimes not perfectly oſſified till ſeveral years after birth; and the Anterior *Fontanella* often remains in adults, as many anatomiſts affirm, amongſt whom is Kerckringius, who ſays it is nothing extraordinary, he himſelf having obſerved it in ten different people (*Oſteogenia Foetuum*, *Cap.* II.).

 the

the three kinds of immoveable union, or of *immediate ſymphiſis*, of bones, occur in the head: for, of the bones of the face, for example, ſome of the noſe are joined together by Harmony; others, as the teeth, by *Gomphoſis*; and thoſe of the ſkull by Suture.

There are five Sutures: three of which are named *True*, and two *Falſe* or *Spurious*.

The *Coronal Suture* meaſures the head tranſverſely; and connects the *Os Frontis* with the *Oſſa Parietalia*.

The *Sagittal Suture* divides the ſuperior part of the ſkull into two equal parts, and connects the *Oſſa parietalia* together. It begins at the middle of the coronal ſuture, and ends at the middle of the lambdoidal.

The *Lambdoidal Suture* joins the *Os occipitis* to the bones of the crown of the head. Little bones are very frequently found, generally of a triangular figure, in this ſuture, between the *Os occipitis* and the *Oſſa ſincipitis*. The ſutures now mentioned, are *True* ones.

The two *Falſe* or *Spurious Sutures*, by which the *Os Temporale* of each ſide is connected with the *Os Parietale* of the ſame ſide, are called *Squammous*.

The Sutures hitherto mentioned only connect the bones of the head to one another; and are, therefore, called *Proper Sutures*, in contradiſtinction to thoſe which join the bones of the head to the bones of the face, called *Common Sutures*. Of the latter, there are four;

four; to which particular appellations are aſſigned, viz. the *Tranſverſe Suture*, by which the *Os Frontis* is connected to the *Os Naſi*; and the *Sutures of the Sphoenoidal, Ethmoidal* and *zygomatic* bones, by the intervention of which, they are connected with the bones next them. There are no particular names given to the other ſutures, becauſe they are of leſs concern.

The juncture of the true ſutures is made by means of bony irregularities and hook-like projections, of greater or leſs ſize, which are reciprocally appropriated to, and confined by, others of the correſponding bone.

The uſe of the ſutures of the *cranium* is (1.) that the hollow ſphere may be better formed: (2.) that, during birth, the magnitude of the head of the *foetus* may be leſſened; for, at that time, the bones are not only preſſed nearer to one another, but alſo frequently aſcend over one another, ſo as greatly to facilitate the labour: (3.) that, by including evident ſpaces, there may be a communication between the *dura mater* and *pericranium*; and conſequently, of the internal and external veſſels of the ſkull: (4.) that fractures of the ſkull may be leſſened in their extent; for theſe ſutures put limits to fractures [22]: (5.) that, by yielding,

[22] Fractures nevertheleſs are ſometimes found continued through the ſutures; but whether the violence were at once inflicted on both bones, or whether it affected only one, ſo that the fracture was continued from it to the other,

yielding, or receding one from another, they may often defend the brain from external injuries; which, but for that, might be productive of irreparable harm.

Of the Bones of the Skull.

Of the eight bones, which form the ſkull, the foremoſt is the *Os Frontis*. Its *figure* is very much like that of a cockle's ſhell ([23]). In adults, it is only one bone: but in infants, it is very evidently compoſed of two.

The *ſtructure of the os frontis*, as of the other bones of the *cranium*, is compoſed of two *laminae*, with an intermediate ſpongy ſub-

other, in the caſes which I have ſeen and read, it is hard to ſay. I am of the former opinion, if the ſutures be perfect.

Sometimes there are no ſutures: inſtances of which are cited by Diemerbroeck, from Ariſtotle, and Veſalius, Fallopius, Coiter, Joannes à Cruce, Alexander Benedictus, &c.

Euſtachius has deſcribed a double ſagittal ſuture *(Oſſium Examen.)* The ſagittal ſuture is often extended through the *os frontis* (Note [26]); and has been ſeen continued through the *Os Occipitis* as far as the Great Occipital *Foramen* (Veſalius, *De Fab. H.* 6. *Lib. I. Cap. V. Fig.* 3. 4. Paaw, *In Celſ. De Medic. Cap. I.* Sylvius, *Comment. ad Galen de Oſſib.)*.

M. Thouret ſays, that the ſutures being preſſed together, and the brain being diminiſhed and equally compreſſed, while the child's head paſſes through the *pelvis*, ſhows that one uſe of the ſutures is to render the child torpid and inſenſible *(Hiſt. de la Société Royale de Medecine*, 1779.).

([23]) *Concha Bivalvis. Linnaei Syſtema Naturae.*

 ſtance.

ſtance. The oſſification of this bone commences over the ſuperciliary arches.

We ought to remark in the *os frontis*, its *external ſurface*, which is convex and prominent; and its *internal ſurface*, which is concave; its *ſuperior margin*, its *two lateral margins*, and its *inferior margin*. The three former of which are deeply denticulated; but the inferior margin is broad and unequal. In infants, a large portion of the ſuperior margin is wanting; ſo that the *fontanella*, as already noticed, is thereby enlarged.

The *External Eminences*, *Depreſſions* and *Cavities* of the *Os Frontis* are the following: (1.) two eminences on each ſide of the convex ſurface, immediately above the margin of the orbit; in which are formed the pituitary ſinuſes of the *os frontis*; and two other eminences forming the *ſuperciliary arches*. (2.) there are alſo five *apophyſes* belonging to this bone: viz. one called *Naſal*; two *External* and *angular*, which extend to the *Os Jugale*; and two *Internal*, which extend to the *Oſſa Lachrymalia*.

The *Depreſſions* and *Foramina* of the *Os Frontis* are (1.) the *two large depreſſions* which make the ſuperior part of the orbits (24): (2.) the ſmall depreſſion, behind the internal an-

(24) In this part of the *os frontis*, called the *Orbitar Proceſs* there is no ſpongy ſubſtance or *diploë*, which is obſervable between the tables of the ſkull in moſt other parts. This ſeems to depend on the preſſure of the anterior lobes of the brain, on one ſide; and that of the eyes, on the other.

gular *apophyſes*, which is the ſeat of the tendon of the *obliquus ſuperior* muſcle of the eye: (3.) the depreſſion, which is deeper than the former, and ſituated below the external angular apophyſes, to receive the Lachrymal Gland: (4.) there is likewiſe a part of the temporal depreſſion on each ſide of the *Os Frontis*: (5.) In the internal part of the ſuperciliary arches, there is a notch or *foramen*, which is called the *Foramen orbitarium ſuperius.* A ſmall twig from the firſt branch of the fifth pair of nerves, and alſo a ſmall artery paſſes through this *foramen.* Surgeons therefore ſhould take care how they make inciſions in this place, eſpecially in children (25): (6.) the *Foramen Orbitarium Internum*, through which a twig from the firſt branch of the fifth pair of nerves paſſes, together with a branch of the ophthalmic artery: (7.) laſtly, the *Foramen* in the internal angle of the eye.

The *Internal Eminences* and *Cavities* of the *Os Frontis.* There is an acute line in the

(25) The fear is not only leſt the nerve ſhould be hurt, but alſo leſt the artery ſhould be divided. For neither can the artery itſelf contract, nor can the haemorrhagy be ſtopped by aſtringents. Compreſſion, for the ſame reaſon, would be uſeleſs, and cauſtics, which render the bone carious, would be dangerous. The reaſon of all which is evident. In many ſkulls, more eſpecially thoſe of children, there are numerous furrows in the convex ſurface of the *os frontis*; and there are arteries correſponding to theſe furrows, and faſtened to them; ſo that they cannot themſelves contract, by reaſon of their attachment; nor can they be conſtricted by aſtringents, or made to coaleſce by preſſure, becauſe they are partly hidden in, and attached to, the furrows.

middle,

middle, called the *Frontal Spine*; and above it, a long *Furrow*, which is the ſeat of the longitudinal ſinus ([26]) ; and below it, the *Foramen Coecum* or *Clauſum*, as it is called ([27]) ; and below the *foramen coecum*, there is a notch for the reception of the ſieve-like part of the ethmoid bone. There are likewiſe *two De-*

([26]) Sometimes, inſtead of this Furrow, there is a ridge to which the ſuperior part of the longitudinal ſinus is attached. It has been ſaid, that the ridge is found in thin ſkulls, in which it ſerves as a ſupport; and that the furrow is only in thick ſkulls, where no ſupport is needed. But Monro was of a different opinion; having ſeen a furrow in very thin ſkulls, and a ridge in very thick ones. This Anatomiſt imagined that it depends upon the different times at which the oſſification of the *Oſſa Pari-talia* is completed. If the ſuperior edges of theſe bones meet, before they have ceaſed to grow, their fibres will extend onwards where leaſt reſiſtance is given; that is, between the hemiſpheres of the brain. This explanation is certainly probable; and Dr. Monro hath given another reaſon which makes it ſtill more probable. It is this, that adults, whoſe frontal bone is divided by the ſagittal ſuture, never have a ridge in this place. (Oſteol. p. 83.)

The ſagittal ſuture is ſaid by Riolan to be continued through the *os frontis* to the naſal proceſs oftener in women than in men (*Anat. Sect.* II. *Cap.* XIX.)! But Veſalius's opinion is diametrically oppoſite (*Lib.* I. *Cap.* VI.)!

([27]) The Longitudinal Sinus begins at this *foramen*, which ſometimes opens into the ſuperior ſinuſes of the *os ethmoides*, ſometimes only through the firſt table of the ſkull. Morgagni ſays, that a ſmall proceſs of the falx of the *dura mater* is lodged in it; together with an artery and ſometimes a vein (*Adverſ. Anatom.* VI. *Animad.* 31.). Ingraſſias had long ſince noticed, that this hole is ſometimes in the ſuperior part of the baſe of the *criſta galli* (*Comment. in Galen De Oſſib. Cap.* I. *Com.* VIII.).

preſſions

preſſions in which the anterior lobes of the brain reſt; and *furrows*, without name; and *Depreſſions* ſtill ſmaller than they. If the *os frontis* be cut tranſverſely over the orbital ridges, by means of a ſaw, we may ſee the two *Pituitary Sinuſes*, formed by the ſeparation of the bony tables of the *os frontis* from each other. Theſe are moſt commonly parted from each other by the intervention of a bony partition. They open into the noſtrils, at the internal angular proceſs, but are not formed in infancy.

The *Os Frontis* is connected with three bones of the *cranium*, and four of the face: (1.) ſuperiorly, it is joined to the *oſſa parietalia* by the coronal ſuture: (2.) inferiorly and internally to the ethmoid bone; from which, the ſuture connecting it receives its name: (3.) poſteriorly, and inferiorly, to the *os ſphoenoides*, by the ſphoenoidal ſuture: (4.) inferiorly, and anteriorly, to the bones of the noſe, by the tranſverſe ſuture: (5.) inferiorly and laterally to the lachrymal bones, by harmony: (6.) to the ſuperior maxillary bone, by the tranſverſe ſuture: (7.) by its internal angular proceſs, to the zygomatic bone, by the zygomatic ſuture.

The *Uſe of the Os Frontis* is, to form the temples, orbits, and frontal ([28]) and pituitary *ſinuſes*

([28]) This part, like the orbital proceſs, has no intermediate *diploë*; but, inſtead of it, the cavities or ſinuſes here mentioned. Sometimes, however, there are no ſuch ſinuſes,

ſinuſes, even in adults; which Fallopius ſays is oftener the caſe, where the *os frontis* is flat, and the ſagittal ſuture is extended down to the naſal proceſs (*Expoſ. De Oſſib. Cap.* XIII.). On the contrary, Paaw, Riolan, Highmore, Palfyn, and Albinus, have found them where the ſagittal ſuture was continued through the *os frontis*. And Albinus obſerves, that the ſagittal ſuture thus continued through the *os frontis*, is likewiſe continued through the interſtice, placed between the two ſinuſes; ſo that, properly ſpeaking, there is no partition between them; one ſinus being in each part of the *os frontis* (Albinus, *A. A. Lib.* I. *Cap.* XI.). In a full growh fœtus, the eminences above the margin of the orbit are ſaid by Dr. Neſbitt to be more protuberant than at full growth (Hum. Oſteog. p. 47.); yet, in a fœtus, there is not the leaſt appearance of frontal ſinuſes upon cutting through the *Os Frontis*. Beſides, Riolan found them in perſons, when the forehead and noſe was flat and depreſſed (*Comment. de Oſſib.*); ſo that a flatneſs of the forehead is not a ſufficient ſign, by which to declare there are no frontal ſinuſes. There is commonly a bony partition between the right and left ſinuſes; but the diviſion is ſeldom exact, or the figure of the incloſed ſpace determinate. The partition too is often imperfect. Sometimes there is only one ſinus, there being no bony *ſeptum*, and that one ſinus extended over the whole orbit; and ſometimes the ſinus is on one ſide only. Sometimes, inſtead of the frontal ſinuſes there are many cells ſeparated by bony *ſepta* (Marherr, *Praelect. in Herm. Boerh. Inſtit. Med.* § 492.). Wriſberg has remarked, that the frontal ſinuſes in a male perſon extended over the whole orbit; that the plates of the orbitar proceſs of the *os frontis* were ſeparated two or three lines; and, that the ſinuſes entered into the leſs wings of the *os ſphœnoidale*, and communicated with the ſphoenoidal *ſinuſes*, by a diſtinct canal, paſſing to the inſide of the optic *foramen*. He likewiſe obſerved, that the frontal ſinuſes become the aſylum of various kinds of worms (Haller, *Pr. Lin. cum Animad. Wriſbergii in* § CCCCLXI. *Edit. Gottin.* 1780.). The opening of theſe ſinuſes is by one or two oblique canals leading into the anterior cells of the *os ethmoides*. Thus they communicate with the noſtrils, and diſcharge a mucus, which is ſecreted by the membrane lining them. Theſe

ſinuſes

ſinuſes (29) to enlarge the organ of ſmelling; to contain the anterior lobes of the brain; and to receive the longitudinal ſinus of the brain. Laſtly, it is connected with other contiguous bones by intermediate ſutures, more or leſs conſpicuous (30).

The

ſinuſes not only enlarge the organ of ſmelling, but render the voice more ſonorous and melodious.

(29) It may be aſked what ſinus Leber means? Mr. William Cowper, obſerved, that—"Beſides theſe (i. e. the Frontal Sinuſes) in that part of the *os frontis*, that is contiguous to the *os unguis* in the orbit of the eye, there are divers irregular cells, which alſo open into one another, and into the *Foramina Narium* and *Antrum Maxillae Superioris*. Backwards, theſe cells alſo open into the cavity of the *Cella Sphoenoidis*. Theſe cells are not (at leaſt commonly) taken notice of by Anatomiſts (Drake's *Anthrop. Nova*. Vol. II. p. 310.)." Such are Cowper's words. It were to be wiſhed that Leber had been more explicit; for, whether any thing elſe be intended than what is deſcribed in Cowper's words; or, whether even that be intended, by his *ſinus pituitarii*, I am uncertain.

(30) The *os frontis*, which in adults is oftener one bone (26) is obviouſly divided into two at birth. The inferior part of the anterior *fontanella* is formed by the ſpace included between the ſuperior extremities of the two bones; each of which, in receding from its fellow, forms a curve.

The Superciliary Arches and Protuberances, which mark the frontal ſinuſes in an adult, are now more conſiderable than at full growth; but there are no frontal ſinuſes.

The *Foramen Orbitarum Internum*, generally formed of the *os frontis* and *os planum*, which ſerves for the paſſage of the naſal twig of the firſt branch of the fifth pair of nerves, cannot be found at birth.

The bones are not connected by ſuture, except the *os petroſum* and *os occipitis*; but by intermediate membrane (21.).

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The two *Offa Parietalia* or *Offa Bregmatis* conftitute the fuperior, and alfo the two lateral parts of the fkull. They are the broadeft bones of the head, and are fomewhat quadrangular.

Their *Subftance* is like that of the other bones of the fkull.

Offification is firft obfervable in the middle of thefe bones. The following circumftances may be noticed concerning them: (1.) as to their *external furface*, it is convex; and their *internal furface* is concave: (2.) of their four margins, the *fuperior* is the largeft, and forms the fagittal future. It is imperfect in infants, and confequently enlarges the *fontanella*: the *anterior margin* forms the coronal future, with the *os frontis*; and the *pofterior* the lambdoidal future, with the *os occipitis*. The *inferior margin* is contiguous to the *offa temporalia*. The three former margins are denticulated; but the laft adheres to the temporal bone, by the fquammous future: (3.) *Four angles*; *two anterior*, of which one is fuperior, another inferior, but the longeft of the four, and diftin-

The Offification of the *os frontis* begins, as Leber obferves, over the middle of the fuperciliary arches (Nefbitt's Hum. Oft. p. 49.); and does not come from the circumference to the center, as Kirckringius afferted (*Oft. Foet. Cap.* 11.).

The *os frontis* begins to be formed between two and three months after conception; and the two difunited parts feem to continue the fame, from the fifth to the ninth month; except that the fpace between them is gradually leffened (Nefbitt's Hum. Oft. p. 50.)

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guiſhes the right bone from the left; and *two poſterior.*

Moreover, it ſhould be noticed, that there is a *Semicircular Arch* on the external ſurface of theſe bones, marked by the adheſion of the Temporal Muſcle.

Of the *Foramina of the Oſſa Parietalia,* there is commonly one on each ſide, deſtined for the paſſage of blood-veſſels to the longitudinal ſinus (31). On the internal ſurface of theſe bones, there are many irregular furrows, in which veſſels are attached: but the chief of theſe furrows are they in the anterior and poſterior angle, and that which receives the longitudinal ſinus of the *dura mater* (32).

The *Oſſa Parietalia* are joined (1.) to each other, at their ſuperior margins, forming

(31) Sometimes this *foramen* is in one of the *Oſſa Parietalia* only; and ſometimes it is in neither. When it is preſent it often leads no farther than the diploë; but oftener through both tables of the ſkull. It commonly ſerves only for the paſſage of a vein from the integuments of the head to the longitudinal ſinus: but Monro ſometimes ſaw a branch of the temporal artery going through it to the ſuperior part of the falx, and the ſides of the *dura mater*; where it had free communication with the branches of the external carotid artery (Oſt. p. 91.). If in cutting near theſe *foramina*, the veſſels be divided, they ſhrink within the ſkull, and a dangerous haemorrhage ſometimes follows.

(32) Albinus has ſpoken elegantly of the formation of theſe furrows (*An. Acad. L.* IV. *C.* I.): he differs from Palfin (*Anat. du Corps Hum. Trait* VI. *Cap.* 4.) and Haller (*Prael. in Boerh.* § 304. e.). Indeed, Albinus puts the matter beyond all doubt, by aſking—" *Nonne enim formantur oſſe circum arterias ſenſim creſſente?*" Cowper ſays, he ſaw canals beginning near the *os occipitis* (*Anat. Exp.* XC. *Tab. Fig.* 2.).

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the ſagittal ſuture: (2.) to the *os frontis*, at their anterior margins, forming the coronal ſuture: (3.) to the *os occipitis*, at their poſterior margins, forming the lambdoidal ſuture: and (4.) to the *Oſſa Temporum*, and *Sphoenoidale*, at their inferior margins, forming the ſquammous ſuture.

Their *Uſe* conſiſts in being an arched roof, for the defence of the middle lobes of the brain, and an attachment for the longitudinal ſinus (33).

The *Os Occipitis* takes its name from its poſition. It conſtitutes the hindermoſt, and is in part the inferior portion of the ſkull. It is a large, flat bone, and reſembles an oblong, irregular arched quadrangle. In adults, it is an entire bone; but in *foetus*, and in delicate children, it is compoſed of four ſpecial parts; in the middle of all which, *Oſſification* is firſt obſervable.

The *Os Occipitis* is divided, into its *external ſurface*, which is convex and flat; and its *internal ſurface*, which is concave; into *four margins*, viz. two ſuperior, denticulated, and two inferior, unequal; to which belong

(33) The figure of theſe bones in foetus is different from that in adults. The ſuperior and anterior extremities of both receding from each other, to form the poſterior and ſuperior part of the anterior *fontanella*. Internally there are no furrows in conſequence of the arteries of the *dura mater*. Theſe bones begin to be formed between two and three months after conception; and in ſix months they have the ſhape of full grown foetal bones (Neſbitt's H. O. p. 51.).

as many *angles*; one angle, which is the ſuperior, is almoſt ſpherical; the two lateral angles; and the inferior angle, which is diſtinguiſhed by the peculiar name of *Sphenoidal Apophyſis.*

On the external ſurface of this bone, there are the following *eminences:* (1.) in its middle, the *Tuberoſity*, as it is called; to which the cervical ligament is joined, and from which an acute line proceeds, named the *Occipital Spine:* (2.) There is an arch extended tranſverſely above the occipital ſpine, to which many muſcles are fixed. (3.) The two *Articular Condyles*, on each ſide, near the great occipital *foramen*, which are received by the ſuperficial articular depreſſions of the firſt *vertebra* of the neck, forming a joint. (4.) The *Sphenoidal Proceſs.*

The *Depreſſions* and *Cavities* of the *os occipitis* are (1.) ſix external on the ſides of the occipital ſpine; *two uppermoſt*, *two lowermoſt*, and *two middle* ones: (2.) two ſmall depreſſions before the articular condyles, and many ſmaller in the cuniform proceſs. *Four Notches, two large* and *two ſmall*, at the margin of the ſphenoidal proceſs; which, together with the notches of the petrous part of the temporal bone, form the poſterior *Foramina Lacera.*

It has *five Foramina:* (1.) The *Foramen Magnum Occipitale,* through which the *medulla oblongata* paſſes, and the acceſſory nerve of Willis, and the vertebral artery: (2.) The four

four *foramina* of the articular condyles; two anterior, for the paſſage of the ninth pair of nerves, and two poſterior, for the paſſage of the jugular veins (34).

The *Internal Eminences* and *Cavities* are (1.) two eminences, like a croſs, called for this reaſon, the *Internal Crucial Spine* of the *os occipitis*. The ſuperior part of this crucial ſpine is excavated in the middle or laterally, that it may receive the ſuperior longitudinal ſinus. The two lateral parts are likewiſe excavated, and receive the two lateral ſinuſes. The inferior part, or *Internal Occipital Spine*, ſerves for the attachment of the ſmall occipital *ſeptum*.

Four *Depreſſions* are made by the crucial ſpine, viz. two *ſuperior*, which receive the poſterior lobes of the brain, and two *inferior*, deſtined to contain the *cerebellum*.

The Sphenoidal Proceſs has a *Long Excavation* in it, where the *medulla oblongata* lies.

The *Subſtance* of the *os occipitis* is compoſed of two *laminae*; between which, the ſpongy ſubſtance is in greater or leſs quantity in ſome parts than in others. The *os occipitis* is thickeſt at its ſuperior and middle part, and thinner at its inferior part.

It is *connected with four bones*: (1.) ſuperiorly, with the *oſſa parietalia*, by the lamb-

(34) One of theſe *foramina*, and ſometimes both, are wanting. In the latter inſtance, the jugular veins paſs through the *foramen magnum occipitale*, to go to the lateral ſinuſes.

doidal ſuture: (2.) laterally, with the *oſſa temporum*, by the lambdoidal ſuture alſo (35): (3.) inferiorily and anteriorly, with the ſphenoidal bone, by the ſphenoidal apophyſis: (4.) inferiorly, with the firſt *vertebra* of the neck, by *ginglimus*.

The *Uſe of the os occipitis* is, to contain the *cerebellum* and poſterior lobes of the brain; to afford a paſſage for the *medulla oblongata*, and various nerves and veſſels going in and out of the ſkull. Laſtly, it ſerves in moving and keeping the head ſteady (36).

The

(35) The *Os Occipitis* is more commonly ſaid to be connected laterally with the *oſſa temporum*, by the *Additamentum Suturae Lambdoidalis*.

(36) The *Os Occipitis* conſiſts of four bones, at birth; connected together by cartilage. The firſt and largeſt, conſtituting the poſterior part of the *os occipitis*, and ſituated above the great *foramen*, is in figure like a ſpherical triangle. Its figure, in fœtuſes of the ſame age, varies more than that of any other bone of the head. It is often divided from its ſuperior angle as far down as its middle; ſometimes there is a notch here, and ſometimes it is without either notch or diviſion. The protuberance, or tuberoſity as it is called, is larger in proportion to the reſt of the bone than in adults. It is more concave internally than in adults. Small bones called *Oſſa Triquetra* (See Note 54.) are frequently found at the uppermoſt angle of this bone, at birth; which is a proof, as Dr. Neſbitt remarks, that theſe little bones are natural, and not the conſequence of fractures (Hum. Oſt. p.53.).

The condyloid proceſſes which belong to the ſecond and third portions of this bone, are not ſo large in proportion to the whole, as in adults.

The Fourth part, commonly called the cuneiform proceſs, differs from that of adults, in having a leſs hollow interiorly for the *medulla oblongata*.

All

The *Oſſa Temporum* are two bones occupying the lateral parts of the head, conſtituting the *Temples*, as they are called, and concurring to form the baſis of the ſkull. The *figure* of each bone is irregular. In adults, each bone is entire; but in young children, the ſquammous part is ſeparated from the petrous. The point of oſſification is firſt diſcernible under the beginning of the zygomatic apophyſis of the ſquammous part. The petrous part in a foetus ſeven months old, is altogether compoſed of a ſofter ſubſtance (37).

Each of theſe bones in an adult is divided into two parts, viz. one which is ſemicircular, and is called *Squammous*; and another which is pyramidal, and called *Petrous*.

All theſe bones, as they are called, are connected to one another by cartilage; and to the *oſſa parietalia* by membrane. The petrous connection is by cartilage and membrane.

The oſſification of theſe bones is never completed till after birth.

(37) At birth, each temporal bone is generally ſaid to conſiſt of three diſtinct parts, independent of the bones of the ear; viz. the ſuperior or ſquammous part, the inferior or petrous part, and the *circulus* or *annulus* which ſurrounds the orifice of the *tympanum*. The laſt part is only mentioned in the Oſteogeny, where the threefold diviſion is uſed. This *annulus*, though perfectly formed three months after conception, is as ſmall as a hair; and becomes gradually elaſtic, till encreaſing in growth, its elaſticity diminiſhes, and is at length imperceptible. It is not a perfect ring, as one would imagine from its name, for its two extremities do not meet, but are attached to the ſquammous part of the temporal bone.

We may consider in the squammous part,

The *External surface*, which is convex, and the *internal surface*, which is irregularly concave:

The *Two Semicircular Edges*; of which, the one is contiguous to the zygomatic bone, and the other to the parietal and sphenoidal bone (38):

In the petrous part are observed (39),

Three surfaces; an *external inferior*, an *internal superior*, and an *internal posterior* surface:

As many *Angles* as surfaces; by which the surfaces are divided:

The *Apex*; which joins the cuneiform bone:

The *Basis*; which is connected to the *os occipitis:*

The following *Apophyses* or *Processes*, are on the external surface of each temporal bone.

The *Mastoid Process*, situated inferiorly and posteriorly, and composed internally of many small cells, which are lined with a mucous membrane (40):

(38) This edge does not lap over the parietal bone at birth.

(39) So called from its hardness; for which reason, it has also been called *Os Lapidosum*. At birth it is harder than the other bones; and in adults it is so hard as to be exceeded only by the enamel of the teeth.

(40) This process is not formed at birth, nor is its place supplied by cartilage. It is not solid in adults, but has numerous small cells internally, which open into the cavity of the *tympanum*.

The

The *Styloid Proceſs* ariſing from the petrous part (41):

The *Zygomatic Proceſs*, which begins at the ſquammous part, is thicker at its origin, and ſends an *oblique eminence* to the articulation, intended to ſtrengthen the interarticular meniſcoid cartilage. As it deſcends, it becomes ſmaller; and is at laſt connected with the temporal proceſs of the zygomatic bone, to form with it the *Zygomatic Arch* (42).

The *External Cavities* of the temporal bone are,

The *Articular Cavity* of its inferior ſurface (43):

The

(41) This is always cartilaginous at birth, and is often not perfectly oſſified even in adults. Sometimes it conſiſts of many parts. This proceſs is always cloſe to the ſkull in fœtus, and is extended acroſs the *Meatus Auditorius externus* till ſome months after birth.

(42) Perhaps it would be better to ſay, that the zygomatic proceſs which ariſes from the inferior part of the ſquammous portion of the temporal bone, is connected with the zygomatic apophyſis of the zygomatic bone: for, the zygomatic arch is formed by this connection, as Leber himſelf notices in deſcribing the zygomatic bone; but he makes no mention of the temporal proceſs of the zygomatic bone, there being no ſuch proceſs; this, therefore, ſeems to be a miſtake in the original, unnoticed in the *errata* of the Latin edition. It is enough for me to mention it in a note.

(43) This oblong cavity correſponds with the condyle of the inferior *maxilla*. A tranverſe ſection of both the articular cavity and oblique eminence of the zygomatic proceſs of the temporal bone, repreſents the italic letter *S*. They both ſerve for the articulation of the condyloid proceſs of the lower jaw; and are covered with a car-

tilaginous

The *Fissure* in the middle *of the Articular Cavity:*

The *Orifice* of the *Meatus Auditorius Externus*, on the external surface of the squammous part:

The *Furrow* under the mastoid apophysis:

The *Stylo-mastoid Foramen*, situated between the mastoid and styloid apophyses; and destined for the transmission of the *portio dura* of the auditory nerve (44):

The *Notch* of the petrous part, which together with a similar one of the *os occipitis*, forms the *Foramen Lacerum*, out of which the external jugular vein goes:

The *Carotic Canal*, by which the internal carotid artery enters, and the great intercostal nerve goes out:

The Bony Part of the *Meatus Auditorius Externus*, near the canal above mentioned, which runs between the squammous and petrous parts to the *tympanum*.

Internally, we may notice in each of the temporal bones,

Small Denticulations, of which the squammous suture is formed:

The *Depression*, in which the middle lobe of the brain rests: Also various furrows

tilaginous substance, which Mr. Hunter says is somewhat ligamentous (Nat. Hist. of the Hum. Teeth, p. 9.); for by putrefaction it peels off, like a membrane, with the common *periosteum*.

(44) This *foramen*, or *Aquaeductus Fallopii*, is larger in foetus than in adults.

running

running without any determinate order or number, but ſerving for the attachment of veſſels:

The *Furrow* of the ſuperior angle, for the middle ſinus of the *dura mater:*

The *Meatus Auditorius Internus*, on the poſterior ſurface of the petrous apophyſis, which is the paſſage of the *portio mollis* of the auditory nerve (45):

The *Internal Orifice of the Aqueduct of Fallopius*, which ends in the *foramen* already noticed, between the maſtoid and ſtyloid proceſſes; receiving the *portio dura* of the auditory nerve:

The *furrow* in the baſis of the petrous apophyſis, for the lateral ſinus of the *dura mater*, and the *depreſſion* for the occipital vein:

In the poſterior angle of the petrous apophyſis, near its middle, the *Foramen Lacerum:*

In the petrous portion of the temporal bone the *Organ of Hearing*; concerning which, the following may betaken into conſideration:

1. The *Meatus Auditorius Externus*;
2. The *Cavity of the Tympanum*;
3. The *Labyrinth*, and
4. The *Meatus Auditorius Internus* (46).

The

(45) This, like the Stylo-maſtoid *foramen*, is larger in fœtus than in adults.

(46) It were needleſs to ſpeak of the bones of the ear at preſent, becauſe the conſideration of them is ſo inſeparably

The *Meatus Auditorius Externus*, is a crooked canal, ſix lines or more in length, and wholly bony in adults. The external orifice of this paſſage, which begins at the *concha*, is ſituated ſuperiorly in the ſquammous, but inferiorly in the petrous portion of the temporal bone: from thence this canal is turned obliquely inwards, and is narrower in the middle than at either ex-

ſeparably connected with that of the other parts, that a mere reference, when treating of the ſenſe of hearing, would not be ſufficient to ſatisfy the curioſity of an inquiſitive perſon, much leſs to ſupplant the neceſſity of concentering the whole anatomy of ſo exquiſite an organ into one point of view. This ſeems to accord with the intention of Leber, whom I conceive to have been of the ſame mind, from the accurate deſcription of the bones of the ear, given near the end of theſe prelections. I ſhall, therefore, content myſelf by remarking that ſome anatomiſts, amongſt whom was Heiſter (*Compend. Anatomic.* § 68.), have conſidered the *Oſſiculum Orbiculare* not as a diſtinct bone, but only an epiphyſis of the longer *crus* of the *incus*. That it is, however, a peculiar bone, conſequently that there are four bones of the ear, ſeems to me demonſtrably evident; for two reaſons: the one is, that when we attempt to ſeparate the bones of the ear from one another, the *Oſſiculum Orbiculare* remains attached to the *ſtapes* as often as it does to the *incus*, which could never happen if it were an epiphyſis of the *incus*. The other reaſon is deduced from the doctrine of epiphyſes, and proved from the irrefragable obſervation of writers on oſteogeny, who have noticed the formation and increaſe of the ſeveral parts, and their changes even to the time of birth. From ſuch obſervation it is certain, that the *Os Orbiculare* of a fœtus only ſix months old, is completely bone: ſo that there is no difference between it in a fœtus and in an adult, except that, like the other bones of the ear, its ſolidity is greater in the latter.

tremity.

tremity. The internal orifice is ſurrounded by a groove, in which the *membrana tympani* is contained. Immediately after birth, the *meatus auditorius* is ſoft, and a bony circle or ring is only found, to which the *membrana tympani* is attached.

The *Tympanum*, or *Cavity of the Tympanum*, is oblong, but in figure indeterminate. It receives the *Meatus Auditorius Externus*. It is divided into an *anterior*, a *poſterior*, and a middle region, in each of which there are various inequalities.

The Cavities and *Foramina* are

The *Orifice of the Auditory Tube*; which is an oblong, conoid paſſage, partly cartilaginous and partly membranous. Its cartilaginous part opens into the ear, but its membranous part, into the cavity of the *fauces*, behind the noſtrils.

The *Canal*, in which the *tenſor tympani* muſcle is fixed. It ariſes from the orifice of the tube, and is terminated at the *feneſtra ovalis* in a ſmall hook.

An *Aperture*, leading to the cellular ſubſtance of the maſtoid proceſs.

The *Feneſtra Ovalis* is an oblong or elliptical *foramen*, opening into the *veſtibulum*, and ſhut by the *ſtapes*.

The *Feneſtra Rotunda* is a *foramen* leſs than the former, but wholly round, leading to the *cochlea*, and cloſed by a particular membrane.

The four following little bones are contained in the cavity of the *tympanum*:

1. The

1. The *Malleus:*
2. The *Incus:*
3. The *Officulum rotundum*, or *orbiculare:*
4. The *Stapes.*

Of the *Malleus* we may obſerve

Its *Round Head*, which is encruſted with a thin cartilage, and annexed to the *Incus* by *ginglymus*.

Its *Narrow Neck*, ſituated between the head and *manubrium* or handle; from which a long ſlender proceſs ariſes, adheres to a furrow in the auditory tube, and is continued as far as the fiſſure in the articular cavity of the temporal bone.

Its *Manubrium*, terminated by an enlarged extremity, and connected to the *membrana tympani* by a ſhort, conoid proceſs.

The ſituation of the *malleus* in the cavity of the *tympanum* is as follows. Its head and neck are ſituated upwards and joined to the *incus:* its *manubrium* deſcends in the direction of the *membrana tympani*, to the middle of which it is attached by means of its large extremities, which are inflected ſomewhat outwards; it is alſo joined to the greater *crus* of the *incus* by a ſmall ligament.

The *Incus* is the largeſt and ſtrongeſt bone of the ear. It is divided into its body and two *crura*.

Its *Body* is ſituated anteriorly, is rather broad than thick, and has two eminences and two depreſſions, both covered with car-

tilage, and intended for the reception of the head of the *malleus*.

Its *Shorter Crus* extends no farther than the cells of the maſtoid apophyſis.

Its *Longer Crus*, together with the *mmnubrium* of the *malleus*, to which it is connected by a ligament, is of the ſame extent as the ſhorter; but its extremity being curved inwards, it receives the *oſſiculum orbiculare*, by the intervention of which it is united with the *ſtapes*.

The *Oſſiculum Orbiculare* is the leaſt bone in the human body. It is ſituated between the long *crus* of the *incus* and the head of the *ſtapes*, and connected with both the bones now mentioned by its two convex ſurfaces.

The *Stapes* is ſo named from the ſimilitude which it bears to a horſeman's ſtirrup. The parts of it to be remembered are,

Its *Head*, which is formed by the union of its two *crura*. It receives the *oſſiculum orbiculare* in its excavated extremity, and is connected by this with the longer *crus* of the *incus*.

Its *Two Crura*, each of which is bent into an arch, as in a horſeman's ſtirrup.

It *Baſe*, which covers the *feneſtra ovalis*.

The *Labyrinth* is that part of the ear, ſituated behind the cavity of the *tympanum*, which opens into the two *feneſtrae* already deſcribed.

We ought to notice in the Labyrinth,

1. The *Veſtibulum*:

2. The

2. The *Three Semi-circular Canals:*

3. The *Cochlea.*

The *Veſtibulum* is a cavity unequally round, ſituated between the *cochlea* and ſemi-circular canals. Its more remarkable apertures are the following: viz.

1. The *Five apertures of the Semi-circular Canals:*

2. The *Feneſtra Ovalis:*

3. The *Scala Veſtibuli.*

The *Three Semi-circular Canals* are ſituated at the baſe of the petrous apophyſis, and, in adults, are firmly faſtened to it. They ſomewhat exceed half the circumference of a circle, and are of leſs diameter in the middle than at either extremity. They are diſtinguiſhed from their ſituation into 1. *Inferior* and *Poſterior*; 2. *Superior* and *Middlemoſt*; 3. and *Exterior* and *Foremoſt.*

The ſituation of the two former is perpendicular, but of the third horizontal. Each of theſe canals has two apertures, though they all open into the *veſtibulum* by five orifices: becauſe one opening of the ſuperior canal is conjoined with another of the inferior, both forming a common outlet.

The *Cochlea* has obtained its name from its figure. It is ſtationed anteriorly towards the apex of the petrous apophyſis.

In the *cochlea* are comprehended

1. The *Bony Nucleus* or *Modiolus Cochleae,* which is of a conoid figure, perforated with many

many ſmall holes, throughout its whole length, and terminated in an apex.

2. The *Spiral Windings* of the cavity about the *modiolus*, like thoſe of a ſnail's ſhell. Of theſe windings, there are only two and a half; which are divided in the middle by a partition, into two equal parts, called *Scalae*. Theſe ariſe from the middle of the *modiolus*, and end in two openings; the one leading into the *veſtibulum*, the other into the *feneſtra rotunda* of the *tympanum*: hence this is called *Scala tympani*, and that *Scala veſtibuli*. The cavities of theſe *ſcalae* communicate with each other, by means of a ſmall *foramen* in the middle of the *modiolus*.

3. The *Spiral Lamina*, which was formerly called the Diaphragm, divides the *cochlea* into two equal parts. It is moſtly bone, but its exterior part is ſomewhat membranous. It is wholly covered with a medullary coat.

The *Meatus Auditorius Internus* is a ſmall bony paſſage, beginning internally by a longitudinal orifice at the poſterior ſurface of the petrous bone, running towards the *veſtibulum* and *cochlea*, and there being divided into two leſs cavities by means of an eminence. The ſuperior and ſmaller of which is the orifice of the Aqueduct of Fallopius, which receives the *portio dura* of the auditory nerve: the other inferior and larger cavity is perforated by very many ſmall holes, through which the *portio mollis* of the auditory nerve paſſes into the labyrinth.

 The

The *Aqueduct of Fallopius* paſſes outwards through the ſuperior ſurface of the petrous apophyſis, and communicates with the cavity of the *tympanum* by means of a ſmall *foramen*, ſituated between the anterior ſemi-circular canal and the *feneſtra ovalis*. It deſcends in the poſterior part of the cavity of the *tympanum*, and opens in a *foramen*, between the ſtyloid and maſtoid apophyſes.

Every part of the ear yet mentioned is covered with a very thin *perioſteum*.

The *Subſtance of the ſquammous part of the oſſa temporum* is compoſed of two bony *laminae* and an intermediate *medulla*. The *Maſtoid Apophyſis* conſiſts of cells, the *Petrous Apophyſis* is a firm and compact ſubſtance.

The *Oſſa Temporum* are connected with five bones of the ſkull: viz.

1. Superiorly, with the *oſſa parietalia*, by the ſquammous ſuture.

2. Poſteriorly and inferiorly, with the *os occipitis*, by the lambdoid ſuture.

3. Anteriorly and Inferiorly, with the *os ſphoenoidale*, by harmony.

The *Oſſa Temporum* are likewiſe joined to two bones of the face: viz.

4. Anteriorly, with the *os jugale*, by harmony.

5. With the lower jaw, by *arthrodia*.

The *uſe* of theſe bones is, to ſeclude and defend the organs of hearing; to contain the middle lobes of the brain, and a part of the

ce-

cerebellum; to form the temples; and to constitute a part of the base of the skull.

The Os Sphoenoidale.

Os Sphoenoideum, or *Basilare*, or *Cuneiforme*, or *Multiforme*, is seated inferiorly at the base of the skull; and is infixed between the bones of the skull and those of the face, like a wedge.

The *Figure* of this bone is like that of a Wasp, or a Bat, with its wings expanded.

In a Fœtus it consists of five parts; and in children, not long after birth, its two lateral parts may be separated from its body.

The spongy substance of this bone is covered with thin bony *lamellae*, which grow very hard by age; but the lateral parts have little *medulla* interposed between their *laminae*.

It is divided into its Body and Processes;—into its *Internal Surface* turned towards the cavity of the skull, and its *External Surface* towards the neck.

The *Eminences*, or *External Apophyses*, are these, viz.

1. The *Inferior Sphoenoidal Spine* situated in the middle of the body of this bone, receiving the *os Vomeris*: from which a small eminence arises at the union of this and the ethmoid bone.

2. The *Two Temporal Processes*, or *Great Wings*, extended as far as the *ossa temporum*, and *sincipitis*.

3. The

3. The *Two Orbital Proceſſes*, connected with the *os frontis*, and *os jugale*, and concurring to form the orbits.

4. The *Two Pterygoid Proceſſes*, each of which is divided into two *Small Wings*, one *External*, another *Internal*. The ſuperior part of theſe proceſſes is called the *End*, the inferior part is called the *Root*.

5. The *Hook* at the end of the poſterior wing, around which the poſterior muſcle of the palate paſſes.

6. The *Two Spinous Proceſſes*, ſituated poſteriorly and ſuperiorly, having a groove laterally, to which the cartilaginous part of the auditory tube is attached.

The *Internal Eminences* are theſe, viz.

1. The *Two Small Wings*, which are very thin, and concur to form the ſuperior orbital fiſſure.

2. The *Four Ephippial Proceſſes*; two *Anterior*, and two *Poſterior* (47).

The *External Sinoſities* and *Cavities* are,

1. The *Sphoenoidal Pituitary Sinuſes*, which are two cavities in the body of this bone, under the *Ephippium*. The ſize of theſe cavities is various. They are commonly divided by a bony *ſeptum*, and open into the cavity of the noſtrils, at the ſides of the ſphoenoidal ſpine (48).

2. The

(47) Theſe are more commonly called *Anterior* and *Poſterior Clinoide* Proceſſes.

(48) Theſe ſinuſes, which are leſs than thoſe of the *os frontis*, are like them ſubject to great variety. When there

2. The *Pterygoid Cavities*, between the pterygoid proceſſes of each ſide, for the inſertion of certain muſcles.

3. The *Two Pterygoid Foramina*, at the root of the pterygoid proceſſes. They are the orifices of two canals diſtinguiſhed by the ſame name, through which the recurrent branch of the fifth pair of nerves paſſes.

4. The *Two Spinous Foramina*, at the apex of the ſphenoidal ſpine, which give paſſage to the middle artery of the *dura mater*.

5. The *Two Spheno-palatine foramina*, through which nerves and blood-veſſels paſs to the pituitary membrane.

The *Internal Foramina* and *Cavities* are

1. The *Two Sphenoidal* or *Superior Orbital Depreſſions*, in the external margin of which there is a ſmall groove, or, as ſometimes hap-

there are two ſinuſes, they are often of unequal extent; but ſometimes there is only a ſingle ſinus and duct leading into one noſtril (Monro's Oſt.). Sometimes there are four ſinuſes ſeparated one from another, by three bony partitions (Sabatier, *De l'Oſteologie)*. Sometimes there are no ſinuſes, but in their ſtead a number of cells (Veſalius, *De Fab. C. H.)*. We are told by Albinus *(De Oſſibus*, § 39.) that theſe ſinuſes have not unfrequently extended as far backwards as the *foramen magnum* of the *os occipitis*.

In a foetus there is no trace of ſinuſes (Marherr *in Pr. Boerh.* § 492.): and even at birth, there is only the beginning of ſinuſes (Neſbit Hum. Oſt.); their place being ſupplied by cartilage.

Theſe ſinuſes, intended, perhaps to enlarge the organ of ſmelling, are inveſted with a membrane, like that of the frontal ſinuſes.

pens, a *foramen* for the paſſage of a branch of the external carotid artery into the ſkull.

2. The *Optic Foramina*, through which the optic nerves paſs, together with the central arteries.

3. The *Depreſſion* between the four proceſſes of the *ephippium*, or *ſella turcica*. It is the ſeat of the pituitary gland. There are likewiſe various ſmall *foramina* in this place, which lead to the pituitary ſinuſes of the ſphenoidal bone. At the poſterior ephippial proceſſes, on both ſides, there is a groove for the internal carotid artery.

4. The *Two Round Foramina*, for the paſſage of the ſuperior maxillary nerve: and

5. The *Two Oval Foramina*, for the paſſage of the inferior maxillary nerve.

The *Os Sphoenoideum* is connected with all the ſeven bones of the ſkull: with three pair, and a ſingle bone of the face: anteriorly, 1. with the *os frontis*; 2. *os ethmoideum*, 3. *oſſa maxillaria*, 4. *oſſa zygomatica*: laterally, 5. with the *oſſa temporum*, 6. *oſſa ſyncipitis*: poſteriorly, 7. with the *os occipitis*: inferiorly, 8. with the *oſſa palatina*, and 9. *os vomeris*.

Its *Uſe* is to contribute in forming the orbits, the temporal depreſſions, and the baſe of the ſkull. It aſſiſts likewiſe the evacuation of the mucus of the noſtrils, and affords a paſſage for moſt of the nerves of the brain.

The Os Ethmoideum.

The *Os Ethmoideum*, or *Cribrosum* has no fellow. Its name is derived from the very numerous holes, with which it is pierced, so as to resemble a sieve. It is situated in the interior and forepart of the base of the skull, between the *os sphoenoidale*, the root of the nose, and the orbital cavities. The superior part of this bone fills up the whole notch of the *os frontis*.

Its *Figure* is very irregular.

In a *foetus*, it consists of three parts; which are again composed of very thin *lamellae*, inclined one towards another. In adults, these parts coalesce into one bone.

The Ethmoid bone has *six surfaces*, viz.

1. The *Superior Surface*, which faces the cavity of the skull, resembles a horizontal plate, and is perforated with very many holes, like a sieve; through which the first pair of the nerves of the brain passes to the nostrils (49).

2. The *Inferior Surface*, which is turned towards the nostrils, is formed like a honeycomb.

3. The *Anterior Surface*, which is contiguous to the *os frontis* and its pituitary sinuses.

4. The *Posterior Surface*, connected with the *os frontis* by a small notch.

(49) At birth it is cartilaginous (Nesbitt's Hum. Ost.).

5. The *Two Lateral Surfaces*, which are thin and smooth, constituting the chief part of this bone, and an internal part of the orbits (50).

The *Eminences* of this bone are,

1. The *Crista Galli*, which is extended from the middle of the superior surface, dividing the bone into two parts. The falciform process of the *dura mater* is fastened to the *crista galli* (51).

2. The *Perpendicular Lamina*, or *Ethmoid Septum*, is continued from the *crista galli*, perpendicularly through the middle of the ethmoid bone. It divides this bone into two equal parts, and is connected with the *os vomer*, where it projects on the inferior surface.

The *Substance* of the ethmoid bone, both superiorly and laterally, consists of thin bony *lamellae*. Inferiorly and internally it consists of the *Superior Spongy Bones*, (52), as they are called: of which the convex part is opposite the

(50) This part is commonly called *Os Planum*. At birth, it is almost entirely surrounded by a cartilage, which lies under a part of the orbital process of the *superior maxilla* and *os unguis*. (Nesbitt.).

(51) The *Crista Galli*, and *Nasal Lamina*, are both cartilaginous at birth (Nesbitt's Hum. Ost.). Fernelius called the *Crista Galli*, *Verruca Praedura*; Sneider called it *Septum Ossis Spongiosi* (Diemerbroeck, *Anat. C. H. Lib.* IX.).

(52) These are also called *Ossa Turbinata Superiora*. They are generally ossified at birth, where they join each other: but posteriorly as they decrease in breadth, they become

the noſtrils, and the concave part is turned laterally towards the ſuperior maxilla. Theſe *Oſſa Spongioſa* are ſeparated from each other in the middle, by a double perpendicular lamina: but they are ſurrounded on all ſides by a pituitary membrane.

The *Cavities* and *Foramina of the Ethmoid Bone* are theſe, viz.

1. The *Ethmoid Foramina*, which are on the ſuperior ſurface, ſerving for the paſſage of the olfactory nerves (53).

2. The

become more cartilaginous. Many have conſidered them as diſtinct, peculiar bones: but there is a manifeſt impropriety in doing it, ſince in adults they are firmly connected with the ethmoid bone. Morgagni has deſcribed two other *oſſa turbinata* leſs than the former (*Adverſ. Anat.* VI. *Tab.* II. *Fig.* 3. q q): and Cowper ſays, there are commonly found two *Oſſa Spongioſa*, placed one above another, and ſometimes three, in each noſtril. That which is continued from the ethmoid bone is irregular, and ſeldom ſeen. The two others are always preſent naturally. The middlemoſt is largeſt, and is attached to the naſal proceſs of the ſuperior *maxilla*, next the cavity of the noſtril of the ſame ſide.

(53) Profeſſor Scarpa, in his deſcription of the *os ethmoideum*, takes notice of *External* and *Internal Foramina* of the horizontal or cribriform plate; which, he ſays, are ſeparated from each other by a (*Rima*) fiſſure, opening between the upper and foremoſt part of the cavity of the noſtrils. He alſo makes a threefold diviſion of the (*canaliculi*) little canals of the ethmoid bone; the firſt and ſhorteſt of which, are few in number, extended only the depth of the horizontal *lamella*, and opening between the beginning of the bony *ſeptum* of the noſe, and the root of the ſuperior ſpongy bones. The ſecond claſs of theſe little canals are more numerous than the firſt, and penetrate deeper; they deſcend through the internal *foramina*

2. The *Orbital Foramen of the Noſe*, which is in the interior ſurface of this bone, and is the paſſage of the ophthalmic nerve.

The *Os Ethmoides* is connected with ſeven bones: that is, with two of the ſkull and five of the face. 1. With the *os frontis*, 2. *os cuneiforme*, 3. *oſſa maxillaria ſuperiora*, 4. *oſſa lachrymalia*, 5. *oſſa naſalia*, 6. *oſſa palatina*, 7. and *os vomer*.

The *Uſe of the Ethmoid Bone* is, to ſupport the anterior lobes of the brain, to afford an exit to the firſt pair of nerves, to ſerve as a place of attachment for the falciform proceſs of the *dura mater*, and laſtly to concur in forming the organ of ſmelling.

The Oſſicula Triquetra (54.).

If theſe bones be preſent, they are of va-

mina to the *ſeptum*. The canals of the third ſeries come from the external *foramina*, having the root and origin of the ſuperior ſpongy bones under them.

None of theſe canals extend as far as the inferior ſpongy bones.

There are two other ſemicanals leading obliquely forwards from the poſterior apex of the middle ſpongy bone, which muſt be diſtinguiſhed from the little canals or tubes of the cribriform *lamella*; for they neither originate at that *lamella*, nor do they receive the firſt, but the fifth pair of nerves (*Anatomicar. Annotation. Lib.* II. *De Organo Olfactus*, &c. *pag.* 6. &c.).

(54) Theſe are frequently called *Oſſa Wormiana*; as if found out by Olaus Wormius. Nevertheleſs Heiſter aſſerts that they were known to Galen (*Comp. Anat.* § 75.). They are likewiſe improperly called *Triangularia* and *Triquetra*: yet their figure is often oblong.

rious

rious ſize (55). Some are ſmall and narrow; others are large and broad (56). Beſides, their number is uncertain (57).

They are oftener found between the bones of the ſinciput and the occipital bone, in the lambdoidal ſuture, than in the coronal and ſagittal ſutures (58). They are very ſeldom found in the ſutures, which intercept the bones of the face, and thoſe of the ſkull. The margin of theſe bones is entirely denticulated,

(55) Diemerbroeck ſays, the greateſt is not larger than the thumb-nail (*Anat. C. H. Lib.* IX.).

(56) Bartholine (*Anat. Reſor.*) and Diemerbroeck both aſſert, that they are larger and more conſpicuous in the concavity of the ſkull (*Ibid.*). But Monro aſſerts the contrary (Oſt. p. 70.), and ſo does Sabatier.

(57) There is ſeldom more than four or five in one ſkull. Heiſter tells us that he kept a ſkull in his muſeum, in which, the lambdoid ſuture being two fingers breadth broad, contained more than twenty diſtinct bones of this kind (*Comp. Anat. Nota d. in* § 75.).

(58) Sabatier ſays they are often found in the ſagittal ſuture, and ſometimes in the coronal, ſphenoid, and other ſutures (*De l'Oſt.*). Dr. Neſbit has given a plate in which there are the beginnings of three, between the ſuperior margin of the greater wing of the ſphenoid bone, and the *os frontis* and *os parietale* (Hum. Oſt. p. 18.). Sabatier cautions Surgeons leſt, in ſearching for injuries of the ſkull, they miſtake the ſutures of theſe particular bones for fractures.

As to the origin of the *Oſſa Triquetra*, Monro's opinion is, that the bones betwixt which they are found, become ſo ſolid before their bony fibres meet, as not to be capable of further extenſion; ſo that the middle ſpace which remains unoſſified, begins to oſſify at ſeveral diſtinct points; which extend and enlarge ſo as to be indented in the margins of the larger bones (Oſt. p. 71.).

 Their

culated, making a true ſuture with the contiguous bones.

THE SECOND ORDER.

The Bones of the Face.

THE Face is the anterior, inferior, and leſs part of the head; ſomewhat like a triangle, and divided into the *Upper* and *Under Jaw.*

To the upper jaw are referred thirteen bones; all of which, one excepted, are pairs.

The under jaw conſiſts only of one bone.

The Oſſa Maxillaria Superiora.

Theſe are the largeſt bones of the upper jaw; placed anteriorly in the middle of the face, and connected with each other.

As to the *Figure* of each, whether it be regarded individually or conjunctly, it is always irregular.

We may obſerve in them

The *External Surface*, which may be ſeen externally in the face and palate:

The *Internal Surface*, making the greater part of the cavity of the noſe:

Their number is greater in children than in adults. They are diſcernible even in the ſkulls of foetus; and conſequently cannot be the effect of fractures.

Both

Both bones have many *Eminences* and *Concavities.*

The *Eminences, external* and *internal* are theſe, viz.

1. The *Naſal Proceſſes*, which reach as far as the *os frontis*, and conſtitute the lateral parts of the noſe.

2. The *Orbital Proceſſes*, which form the inferior margin, the inferior portion, and the inferior fiſſure of the orbits.

3. The *Jugal* or *Zygomatic Proceſſes* continued from the *Oſſa Jugalia.*

4. The *Palatine Proceſſes*, which are conjoined poſteriorly with the *Oſſa Palatina*, and make the anterior part of the palate.

5. The *Alveolar Arch*, which, if both bones be taken together, is compoſed of ſixteen *(alvecli)* ſockets, in which the teeth are contained. The poſterior part, where there are no teeth, is called the *Maxillary Tuberoſity* (59).

(59) The *Alveolar Arch*, or as it is oftener called, the *Alveolar Proceſs*, of the upper and under jaw, is formed of two plates; one external, and another internal. Theſe plates recede farther from each other as they approach nearer to the maxillary tuberoſity; and are connected together by thin bony partitions going from one to the other, ſo as to form the *alveoli.* The tranſverſe partition is higher than the anterior and poſterior plates of the alveolar arches. As the alveolar proceſſes are rather appendages of the teeth than of the jaws, which will be amply explained hereafter, the oſteogeny of them can hardly be ſeparated from that of the teeth (See Note 81. and what follows it.).

6. The

6. The *Nasal Spine*, formed interiorly by the junction of the two maxillary bones, in the cavity of the nose. The *Septum* of the nose and its cartilaginous part adheres to the nasal spine.

The *Cavities* and *External* and *Internal Foramina* are these, viz.

1. A *Large Notch*, for the cartilaginous part of the nose.

2. A *Furrow*, in the superior and internal part of the nasal apophysis, near the orbit, for the lachrymal sac. This furrow, inferiorly constitutes a part of the nasal canal which opens into the cavity of the nostrils.

3. The *Infra-orbital Foramen*, or *Anterior* or *Exterior Orbital Foramen*, is the opening of a canal, immediately under the inferior margin of the orbit, which runs to the orbital apophysis, terminates posteriorly near the inferior orbital fissures in the *Posterior Orbital Foramen*, and transmits the inferior orbital nerve.

4. The *Anterior Palatine Foramen*, in the anterior part of the palatine apophysis, behind the *Incisores* teeth. It opens superiorly at the nasal spine, and is the passage of the anterior palatine artery, together with the membrane of the palate continued into the cavity of the nostrils.

5. *Various Small Foramina* in the maxillary tuberosity, through which the anterior alveolar nerves pass, from the inferior orbital nerve.

6. A *Small Depreſſion* in the ſame place, to which the wing of the palatine bone is affixed. Near this depreſſion, there is likewiſe a *Furrow*; which, together with the palatine and ſphenoidal bones, conſtitutes a canal; the end of which is called

7. The *Poſterior Palatine Foramen.* It is placed behind the laſt of the *molares* teeth, in the maxillary tuberoſity, being the paſſage of the poſterior palatine nerve.

8. The *Sockets*, of which there are ſeven or eight on each ſide ([60]).

9. The *Tranverſe Eminence*, between the bottom of the naſal canal and the maſtoid apophyſis; to which the anterior part of the inferior portion of the ſquammous bone adheres.

10. The *Maxillary Sinus* or *Highmore's Antrum*, which is a large cavity in the middle of this bone, extended ſuperiorly under the orbit as far as its inferior fiſſure, and inferiorly as far as the *alveoli*. The oriſice of this *antrum* in the noſe is partly covered by the inferior ſpongy bones and *oſſa palatina*; and hence it is rendered ſo ſmall as ſcarcely to admit a gooſe's quill ([61]).

The

([60]) Although we have obſerved above ([59]), that as the bony partitions connect the external and internal plates of the alveolar proceſſes, they alſo form the ſockets of the teeth, or *alveoli*; yet we ought to mention, in this place, that whenever a tooth has many fangs, there are always an equal number of diſtinct *alveoli*.

([61]) This cavity or *antrum* is ſeldom wanting, though that it is ſometimes, is aſſerted by Morgagni (*Adverſ. Anat.*

The bones now defcribed are connected to each other, and with ten more: viz. with three bones

Anat. VI. *p.* 116.). Its figure is fomewhat triangular. Its length is nearly two inches, from its fore-part backwards. In depth, it is more than an inch. Cowper fays, it may be beft feen by dividing the bone near the *dentes molares.* It is called by Julius Cafferius *Antrum Genae.*

This *Antrum Maxillæ Superioris*, as Highmore called it (*Difq. Anat. Lib.* 3. *Part* II. *Cap.* I.), is perfectly formed at birth, though not fo large, in proportion to the magnitude of the bone, as in adults. Befides, there is no part of it covered by the *os palati* at birth (*Nefbitt's Hum. Oft.*). Fallopius faid it is wanting in children (*Obfervat. Anat.*). This cavity is lined with a continuation of the fame pituitary membrane that lines the noftrils.

The bottom of this *antrum*, which is a covering to all the roots of the dentes molares, and of the dens caninus of the fame fide, is fo very thin as frequently to be broken in drawing any tooth under it, producing an opening thereby into the mouth. Dr. Highmore faw an inftance of this, and Cooper faw many; but none in which the opening did not clofe again, after the injection of a proper medicine.

Accumulations of matter have been difcharged from the *antrum*, by firft extracting the foremoft *molaris* tooth, and boring into the *antrum*, unlefs it were opened by the removal of the tooth. Thus, whatever was injected into the *alveolus*, returned by the nofe, fo that the patients were fpeedily and fafely cured, as Cowper affirms.

Mr. Hunter obferves, that this *antrum* is very fubject to inflammation and fuppuration, from difeafes of adjacent parts, particularly from an obftruction of the duct leading to the nofe. He doubts whether it be a caufe or an effect, but properly fays, that if it be a caufe, the inflammation of the *antrum* may be induced by a mere accumulation of the natural mucus irritating and diftending for its exit; as an obftruction to the paffage of

bones of the ſkull, 1. the *os frontis*, 2. the *os ethmoides*, 3. the *os ſphœnoides*, to ſix bones of the face, 4. the *os naſi*, 5. the *oſſa lachrymalia*, 6. the *oſſa jugalia*, 7. the *oſſa palatina*, 8. the *oſſa ſpongioſa*, 9. the *os vomer*, and, laſtly, 10. the teeth.

Their *Uſe*. They make a part of the orbits, palate, face, and noſtrils. They ſerve alſo in the ſecretion of the *mucus* of the noſe, in chewing, and in retaining and ſtrengthening the teeth.

of tears through the *ductus ad naſum* cauſes an abſceſs of the lachrymal ſac.

The ſymptoms of this abſceſs are hardly to be diſtinguiſhed from the tooth-ache, in the beginning; but the noſe, eye, and that part of the forehead over the frontal ſinus, is commonly more painful than in tooth-ache. The diſeaſe generally continues longer than tooth-ache, and the cheek at length becomes red and hard above the roots of the teeth. Mr. Hunter, however, confeſſes with no leſs candour than judgment, that the ſymptoms are ambiguous.

The cure is not to be effected by making an opening through the cheek, but as mentioned above, by drawing a tooth, and evacuating the matter by the *alveolus*; or by perforating the *antrum* through the *ſeptum*, which divides it from the noſe. But, if the anterior part of the bone be deſtroyed, an opening may be made on the inſide of the lip, where the abſceſs will moſt likely be felt; and this opening muſt be prevented from healing by appoſite means. The firſt method is the beſt (Hunter's Pract. Treat. on the Diſeaſes of the Teeth, Chap. I. Sect. VII.).

The

The Offa Nafalia.

The two *Offa Nafalia* cohere to each other, at the bafe of the *os frontis* in the anterior and middle part of the nofe.

The *Figure* of thefe bones is like that of an oblong quadrangle.

We may notice of each bone

Its *Two Surfaces,* and

Its *Four Margins.*

The *External Surface* is convex, and inclined fomewhat inwards, forming the ridge of the nofe.

The *Internal Surface,* which is concave, is turned towards the cavity of the noftrils.

The *Superior Margin* is thick but narrow, extending even to the *os frontis.*

The *Inferior Margin* is thin, broad, and denticulated. It unites to the cartilages of the nofe.

The *Internal Surface* is fmooth and connected with its correfponding bone, by harmony. Internally it has a fmall eminence, to which the *feptum narium* adheres.

The *External Surface* is conjoined with the nafal apophyfis of the fuperior maxillary bone.

Each of thefe bones has a *foramen* at its fuperior extremity, which is a paffage alike for nerves and blood-veffels.

They are joined together by harmony; but they are likewife joined to three other bones: viz.

1. The

1. The *Os Frontis.*

2. The *Os Maxillare Superius.*

3. The *Os Ethmoideum*; by means of the internal margin.

Their *ufe* is to form the nofe, and to defend the organ of fmelling (62).

The Offa Lacrymalia.

The *Offa Lacrymalia* or *Offa unguis*, are the leaft and thinneft bones of the face. They are called *Lacrymalia*, becaufe the tears flow over them into the noftrils; and *Offa Unguis*, becaufe they refemble fomewhat the nail of one's finger, in fize and form. Each bone is fituated on one fide of the orbit, at the inferior part of the internal angle.

Their *Figure* is almoft quadrangular.

We may obferve in each

An *External Concave Surface*, turned towards the orbit.

An *Internal Convex Surface*, next to the *os ethmoides.*

Four Margins: viz.

One, *Superior* connected with the *os frontis*,

Another, *Inferior* connected with the fuperior maxillary bone,

(62) The *Offa Nafalia* at birth are perfectly formed, differing from thofe of adults only in the roughnefs and porofity of their internal furfaces. Their connections are membranous (Nefbitt's Hum. Ofteog.).

A third,

A third, *Internal* connected with the thin plate of the *os ethmoides*,

The laſt, *External* connected with the naſal apophyſis of the ſuperior maxillary bone, having a furrow in the middle, which, together with a ſemi-canal of the afore-mentioned apophyſis, forms a *foſſa* for the naſal canal.

The *Connection* is made with four bones: viz. 1. the *os frontis*, 2. the ſuperior maxillary bone, 3. the ethmoid bone, 4. the inferior ſpongy bone.

Their *Uſe* is, to make a *foſſa* for the lacrymal ſac and naſal canal, to be a part of the orbits, and to cover the labyrinth of the noſe (63).

The Oſſa Zygomatica.

The *Oſſa Jugalia*, or *Zygomatica*, or *Oſſa Malae*, are placed ſuperiorly on each ſide of the face (64).

Their *Figure* is unequally quadrangular.

They are divided into an *External* convex ſurface, and an *Internal* concave ſurface, of which the greater part of the zygomatic *foſſa* is made. They are divided alſo into a *Body* and *Four Apophyſes:* viz.

(63) Theſe bones are completely formed at birth.

(64) *Oſſa Malae* is a name aſſigned by Celſus to the upper jaw only (*Lib.* VIII. *Cap.* I.); and *Maxilla* only to the lower jaw.

1. The

1. The *Frontal Apophyſis* or *proceſs*, which is annexed to the *os frontis* at the external angle of the orbit.

2. The *Orbital Apophyſis*, forming a part of the orbit.

3. The *Malar Apophyſis*, joined to the ſuperior maxillary bone.

4. The *Zygomatic Apophyſis*, which connected to the zygomatic apophyſis of the temporal bone, forms the *Zygomatic Arch*.

The *Foramina* and *Cavities* of the *Oſſa Zygomatica* are theſe: viz.

1. *Various Foramina* in the external ſurface, which are the paſſage of nerves and blood-veſſels.

2. The *Zygomatic Foſſa*, under the zygomatic arch.

Each bone is connected with four others: viz. 1. the *os frontis*, 2. the *os maxillare*, 3. the *os temporale*, 4. the *os ſphoenoidale* (65).

The *Uſe* of each of theſe bones is, to ſupport the ſuperior maxillary bone, to form the face, and the inferior and lateral part of the orbit.

The Oſſa Palatina.

The *Oſſa Palatina* are ſituated poſteriorly in the ſuperior part of the palate, between the pterygoid apophyſes and the ſuperior

(65) At birth, they are the ſame as in adults; except that they have no indentations at their edges, for their better connection with the contiguous bones.

maxillary bone; at the ſides of which, in the poſterior part of the noſtrils, they aſcend as high as the orbits.

Their *Figure* reſembles an irregular triangle. They are incurvated upwards, and their ſurface is unequal, becauſe of various eminences and cavities.

Each bone is divided into four regions: viz. 1. the *Palatine*, 2. the *Pterygoid*, 3. the *Naſal*, 4. the *Orbital*; all of them having their ſurfaces and margins.

The *Palatine Region* is placed poſteriorly, It has an *Anterior Margin*, which is connected to the palatine part of the ſuperior maxillary bone; and a *Poſterior*, which is ſomewhat curved, and forms the roof of the palate and the cavity of the noſe. The *columella*, the ſoft palate, and its various muſcles adhere to this margin.

The *Union* of both bones makes a rough line in the ſuperior ſurface; in the middle of which, there is a *Sulcus* for the attachment of the *vomer*. There is too a ſimilar *ſulcus* in the inferior ſurface.

The *Pterygoid Region* is called by ſome the *Pterygoid Proceſs*. It is ſituated inferiorly and poſteriorly between the *alae* of the ſphenoid bone and the maxillary tuberoſity. It is unequal, its ſides being preſſed inwards, and divided from the palatine and naſal regions by a furrow, the end of which furrow is called the *Poſterior Palatine Foramen*, becauſe a branch of the palatine nerve paſſes through it.

it. Near this *foramen*, there are two other ſmall openings, in which is terminated the end of another paſſage, which is alſo deſtined for a branch of the palatine nerve.

The *Naſal Region* is the thinneſt of all. It aſcends laterally, having two ſurfaces; one *Internal Surface*, turned towards the noſe, and ſeparated by a prominent line from the palatine region, on which the poſterior part of the inferior ſpongy bone reſts; and another ſurface called *External*, which is againſt the orifice of the great pituitary ſinus, which is partly covered by it.

The *Orbital Region* is ſeparated from the naſal by a notch, which, uniting with the *alae* of the ſphenoid bone, forms an aperture called the *Spheno-palatine foramen*. This region externally and laterally covers the orifice of the pituitary ſinus of the ſuperior maxillary bone. It ſends an *Apophyſis* ſuperiorly, to the poſterior part of the orbit, which is called *Orbital*.

The *Oſſa Palatina* are joined with two bones of the ſkull: viz. 1. the *os ſphenoideum*, 2. the *os ethmoideum*; and with three bones of the face: viz. 3. the ſuperior maxillary bone, 4. the inferior ſpongy bone, 5. the *os vomer*, 6. and, laſtly, they are joined to each other ([66]).

As

([66]) Theſe bones are larger in proportion to the palate in foetus, than in adults; but they acquire the form of adult bones three months after conception, when they

As to their *Uſe*, they form the poſterior part of the palate, and noſe, and a ſmall part of the orbit. Moreover, they partly cover the pituitary ſinus of the inferior *maxilla*.

The Os Vomer.

This bone is ſo called, becauſe it is like a plough-ſhare. It is a ſingle bone, ſituated perpendicularly in the middle of the noſe, dividing it into two parts.

We may obſerve of the *vomer*,

Two Surfaces; one the *right*, another the *left*, both facing the cavity of the noſtrils.

Four Margins; a *ſuperior*, an *inferior*, an *anterior*, and a *poſterior* margin.

The Superior Margin has a long furrow, to receive the ſphenoid bone.

The Inferior Margin enters the canal of the *oſſa palatina* and *maxillaria ſuperiora.*

The Anterior Margin is divided into two *lamellae*, by which the perpendicular *lamella* of the ethmoid bone, and the cartilaginous part of the noſe is intercepted. The Poſterior Margin is acute inferiorly, but becomes gradually more obtuſe as it aſcends, and, unconnected with the other bones, it is turned to the *fauces*. The *Os Vomer* is connected with four bones: viz. 1. the ſphenoid, 2. the ethmoid, 3. the ſuperior maxillary, 4. the

they can ſcarcely be ſeparated from the membranes containing them (Neſbitt's Hum. Oſteog.).

palatine,

palatine, and, laſtly, with the cartilaginous *ſeptum* of the noſe (67).

Its *Uſe.* It divides the noſe. It ſupports and enlarges the organ of ſmelling.

The Oſſa Spongioſa Inferiora.

Both the *Inferior Spongy Bones* are placed in the inferior and lateral parts of the cavity of the noſtrils. Anteriorly, they are connected to the tranſverſe eminence of the ſuperior maxillary bone; and poſteriorly to the oblique eminence of the palatine bone, in ſuch a manner, that they are above the aperture of the naſal canal, but below that of the pituitary ſinus of the ſuperior maxillary bone.

Their *Figure* is like that of a ſhell; as is that of the ſuperior ſpongy bones, with which theſe very much agree in their aptneſs to break, their tenuity and ſize.

We obſerve in the *Oſſa Spongioſa Inferiora*

1. *Two Extremities*; of which the *anterior* is broader than the *poſterior*.

2. *Two Margins*; the *inferior*, larger, and thicker of which is placed freely in the cavity of the noſtrils: the *ſuperior*, which is thinner, reſting anteriorly on the tranſverſe eminence, already noticed, of the ſuperior

(67) At birth the *Vomer* conſiſts of two diſtinct *lamellae*, which are porous and unconnected with each other; except inferiorly, where the *vomer* unites with the *oſſa palatina* and *oſſa maxillaria ſuperiora.*

maxillary bone, and poſteriorly on the oblique line of the palatine bone.

3. *Two Surfaces*; the external of which being concave, is oppoſite the pituitary ſinus of the ſuperior maxillary bone; the internal, which is convex, being turned towards the *ſeptum* of the noſe.

4. *Two Apophyſes*; a *leſs*, which aſcends perpendicularly, and forms a ſmall furrow at the end of the naſal canal; and a *greater*, which goes in the courſe of the ſuperior margin of theſe bones, covering a part of the aperture of the pituitary ſinus of the ſuperior maxillary bone ([68]).

The *Subſtance* of theſe bones is made up of very thin, ſpongy *lamellae*, covered by a pituitary membrane.

Each is connected with three bones: 1. the ſuperior maxillary bone, 2. the palatine bone, 3. the lacrymal bone.

([68]) It has already been obſerved ([52]), that there are ſometimes three turbinated bones in each noſtril; the middle one being always the largeſt, and the lowermoſt the ſmalleſt. The lowermoſt ſpongy bones, noticed by Cowper, ſeem to be continued from the ſides of the maxillary *ſinus*. Profeſſor Scarpa ſays the *oſſa turbinata inferiora* have no *foramina*, are firmer than the ſuperior, and uneven, becauſe of *(foveoli)* little pits and eminences. He alſo notices two canals of theſe inferior ſpongy bones, the one ſuperior, and the other inferior (*Anatomic. Annot. Lib.* II. *De Org. Olfact. &c. pag.* 13.).

The *Oſſa ſpongioſa inferiora* are as much formed, at birth, as the *ſuperiora*. Dr. Neſbitt could never diſcover any oſſification of theſe parts till nearly five months after conception; when it advances ſo rapidly, as to be equally as perfect at ſix months as at nine.

Their *Uſe.* They encreaſe the ſurface of the pituitary membrane, and, conſequently, enlarge the organ of ſmelling. They form the extremity of the naſal canal, and diminiſh the opening of the *Antrum Highmorianum.*

The Lower Jaw.

The *Inferior Maxillary Bone* or *Lower Jaw*, occupies the lowermoſt and foremoſt part of the face and head. It is the largeſt bone of the face: in figure it ſomewhat reſembles a horſe-ſhoe. In adults it is only one bone, but in *foetus* and delicate children it is compoſed of two.

It is divided into

1. Its *Body*, or Anterior and Middle Part, called the Chin.

2. Its *Superior* and *Inferior Margins:* in the former of which there are ſixteen conoid holes, called *Alveoli*, and as many teeth fixed in them by means of fangs variouſly formed. The *Inferior Margin* is ſubdivided into its external and internal ridges.

3. Its *External* and *Internal Surfaces*, in which the *Maxillary Foramina* may be obſerved.

4. Its *Two Extremities*, which are flatter than the body, each reſembling an irregular triangle.

The *Eminences* of the Lower Jaw are theſe: viz.

1. The *Coronoid Proceſs*, placed anteriorly, is flat and broad below, and terminated in a

 pointed

pointed extremity. The Temporal Mufcle is attached to this procefs.

2. The *Condyloid Procefs*, fituated pofteriorly, is extended into an oblong condyle, covered with cartilage, and received into the articular cavity of the temporal bone, almoft tranfverfely (fee note 43). Beneath this condyle or head is placed the *Neck*, which is inclined fomewhat backwards, having a depreffion for the infertion of the fmall pterygoid mufcle (69).

3. The *Angles* of the lower jaw are placed at the extremities of the inferior margin, where the jaw bone is bent upwards, on each fide.

4. The *External* and *Internal Spines* of the Chin, which are nothing but lines externally and internally at the fymphyfis of the jaw.

The *Cavities* and *Foramina* are

1. The *Great Semi-lunar Notch*, between the coronoid and condyloid proceffes.

2. The *Pofterior Maxillary Foramen*, on the internal furface, under both proceffes. It is the beginning of a canal which paffes forwards through the maxillary bone.

(69) Morgagni (*Adverf. Anat.* II. *Fig.* 1, 2, 3.), Monro (Edinb. Med. Effays and Obf. Vol. I. Art. II.), and Hunter (Nat. Hift. of the Hum. Teeth, Part I.) have treated particularly of the articulation of the lower jaw with the temporal bone. The laft has given a very accurate plate of it. We have faid enough, in various places, to ferve at prefent. They who are defirous to underftand it more fully, may confult the writers above cited.

4. The

4. The *Alveoli*, above mentioned, in the ſuperior margin, which are ſixteen in number (ſee note 60).

The *Subſtance* of the lower jaw is externally compact, but internally ſpongy.

The Lower Jaw is connected with the articular cavity of the temporal bone by arthrodia, and with the *os hyoides* by ſyſſarcoſis.

It is of *uſe* in chewing, ſpeaking, and forming the face more beautiful. It contains ſixteeen teeth, and many ſoft parts (70).

Of the Teeth.

The Teeth are fixed, one after another, in the upper and under jaw, in ſuch a manner, that in an adult, there are naturally *ſixteen* belonging to each. Hence the number of the teeth is univerſally thirty-two (71). They

(70) Beſides being in two diſtinct pieces at birth, connected together by membrane, the condyloid proceſs is much ſhorter than in adults, conſidering its proportion to the lower jaw; and the inter-articular cartilage is more like a thick ligament. The coronoid apophyſis is alſo ſhorter.

The two bones are compoſed of two thin ſides joined only at their bottom, the external *lamella* being more porous and unequal than the internal. The cavity within theſe ſides is divided into five ſeparate cavities by bony partitions.

The Poſterior Maxillary *Foramina* are more backwards than in adults.

(71) Mr. Hunter once ſaw only twenty-ſeven; and ſays, that when the whole number is only twenty-nine or thirty-one, the upper jaw ſometimes, and ſometimes the lower has more. Nay, he found ſixteen in one jaw and only fourteen in another (Nat. Hiſt. of the Hum. Teeth, p. 46.). Hippocrates and Galen accounted the greater ſize and number of teeth a ſign of longevity; but

They are ſmall, yet the hardeſt bones of the body. The middle and broader part of a tooth, which protrudes without the ſocket, is called its *Body*; and the uppermoſt part of the body is called the *Crown* of a tooth. The part which is hidden within the ſocket, and terminated in a wedge-like extremity, is named the *Fang*. Each fang has a ſmall *foramen* in its extremity, by which the artery, vein, nerve, and internal *perioſteum* paſs into the little cavity in the ſubſtance of the teeth. The circle between the crown and fang of a tooth, is denominated its *Neck*, or *Collar*.

The Teeth are divided into three claſſes or orders, *viz.*

1. The four anterior, middlemoſt, broad and ſharp teeth, are the *Inciſores*.

but it is amply proved by Scaliger (*Exerc.* 271. *contra Cardanum.*) that a ſhort life cannot be foretold from few teeth, even when they are ſmall and rugged.

Pliny relates more than one inſtance, where there were two ranges of teeth inſtead of one, as doth alſo Valerius Maximus (*Lib.* I. *Cap.* 8.); and Columbus ſays that his own ſon had three ranges (*De Re Anatomica.*). Sabatier, who has ſeen ſimilar caſes, always obſerved that the jaw was enlarged; and that in ſuch inſtances, it was owing to the canine teeth being placed behind the *inciſores* and firſt *molares* (*De l'Oſteol.*).

Albinus found a tooth implanted in that part of the maxillary bone which unites with the *os palati*; it did not project into the mouth, and he diſcovered it by chance (*Annot. Acad.*). Sabatier ſaw an inſtance of two canine teeth ariſing near each other, which preſſed the middle of the tongue, and were very troubleſome (*De l'Oſt.*).

Sometimes there are no teeth, but in their ſtead one equally extended bone (*pro ſuperiori ordine dentium unum os aequaliter extentum*), as is told by Valerius Maximus (*Lib.* I. *Cap.* 8.) of Pruſias, the ſon of the king of Bithynia, in whom, upon this account, there was neither deformity nor inconvenience.

2. The two next, one on each ſide, are called *Canine*; and the canine teeth of the upper jaw are called the *Eye-teeth*.

3. Next the canine teeth poſteriorly, there are five teeth on each ſide, called *Grinders* (72). The two laſt of which are called *Dentes Sapientiae*, becauſe they are generally formed after the reſt (73).

The *Four Inciſores*, ſo called from their uſe, are ſmaller and narrower in the lower jaw than the oppoſite four of the upper jaw. The *Crown* of theſe teeth is broad, ſharp, and in children often denticulated. Their *Root* is ſhort, laterally broad, ſmooth, and ended in a ſingle, obtuſe extremity (74).

The *Crown* of the *Canine Teeth* is thicker than that of the *Inciſores*. Anteriorly they are convex; poſteriorly they are made round and terminated in an obtuſe apex. Their

(72) Mr. Hunter, conſidering the form, and uſe, and growth of the teeth, has choſen a diviſion different from that in the text. He retains the name *Inciſores* or *Fore-teeth*. He calls the canine teeth *Cuſpidati*. He diſtinguiſhes the two firſt *molares* by the appellation of *bicuſpides*, and gives the name *Molares* only to the three laſt. Hence, in each jaw, he enumerates four *Inciſores*, two *Cuſpidati*, four *Bicuſpides*, and ſix *Molares*.

(73) The *Dentes Sapientiae*, according to Diemerbroeck, are alſo called *Dentes Genuini*, or *Dentes Mentis* and *Intellectus*.

(74) Thoſe of the Upper Jaw protrude farther outwards, and are commonly ſo placed as to cover in part thoſe of the under jaw. The oſſification of the *inciſores* begins at three points, according to Mr. Hunter, the middlemoſt being the higheſt, and the firſt that begins to oſſify (page 88.).

Root

Root is longer and more acute than that of any other teeth; hence thofe of the upper jaw often penetrate the maxillary finus (75).

The *Grinders* differ in fize, the *anterior* being lefs than the *pofterior*.

The *Crown* of the grinders is a broad furface, irregular, with more or fewer eminences; the apex of the anterior grinders is commonly lefs, and only double, but that of the pofterior is much larger, and threefold, fourfold, or fivefold.

The *Roots* of the grinders are long, but lefs fmooth. They are fingle, double, triple, quadruple, though rarely quintuple. They are ftraight or crooked. They are grown together, or not (76).

The

(75) The *Canini Dentes*, or *Cufpidati*, are not exactly in the arch of the jaw, they project fomewhat from it. Hence the four *Incifores* and two *Cufpidati* are almoft in a right line. This is more remarkable in the lower jaw. The enamel being, as it were, feparated from the fides of the *incifores*, led Mr. Hunter to compare the feeming effect of the fang of thefe teeth in feparating the enamel to that of a wedge. The *Cufpidati* differ from the *Incifores*, their fides and edges being covered with enamel. Mr. Hunter fays the *cufpidati* have only one point of offification.

(76) The firft of the grinders, or the former *bicufpis* is not much unlike the canine tooth next it. Both *bicufpides* have lefs enamel laterally than the *cufpidatus*, but more than the *incifores*. Mr. Hunter, fays, that the *bicufpides*, and efpecially the fecond of both jaws, are oftener naturally wanting than any of the teeth, except the *dentes fapientiae*. He thinks they are lefs ufeful, confidering them of a middle nature between *incifores* and *molares*

The *Subſtance* of the teeth is compact (77). The external ſurface of the crown, is covered with a ſingular, thin, white, and poliſhed ſubſtance, like glaſs, which is called the *Enamel* or *Vitreous Cruſt*. It ſurpaſſes in firmneſs and ſolidity the moſt compact ſubſtance of bones (78).

The

molares (p. 57.). They have an external and internal point of oſſification only.

The difference of the *Bicuſpides* and *Molares* of Mr. Hunter conſiſts in the greater ſize of the latter, the greater number of fangs, and the further diviſion of the crown into points.

The *Molares* of Mr. Hunter are covered uniformly, on all ſides, with enamel; and have four or five points of oſſification, the external being always firſt formed.

Mr. Hunter has obſerved that all the teeth have but one fang, except the grinders, each of which has two fangs in the lower jaw, and three in the upper. He imagines thoſe anatomiſts to have fallen into a miſtake, who ſuppoſed the teeth to have more fangs, becauſe whenever they ſaw too canals in one fang, they concluded that ſuch fang was compoſed of two, grown together.

(77) Bartholine confeſſes there are peculiarities in the ſubſtance of teeth, yet does not think they ſhould be excluded from the number of bones (*Anat. Reform.*). Independent of its hardneſs, it has no veſſels, at leaſt none capable of admitting coloured liquors. It is not renewed, like bone, nor does it like bone unite by *calius*. It is not altered by other diſeaſes, Rickets and *Mollities Oſſium* not excepted. The ſubſtance of teeth is nevertheleſs formed of *lamellæ*, as Mr. Hunter diſcovered by ſoftening it in acids, and unraveling it, and by feeding animals on madder (p. 92.).

(78) The Enamel is thickeſt on the *Corona dentis*; it is thinner, where it ſuffers leſs friction, and it is wholly diſcontinued at the neck of the tooth, according to Mr. Hunter (p. 33, and 43.). Marherr aſſerts that

The teeth are fixed in the *alveoli* by gomphoſis (79), ſo that each tooth naturally fills up its appropriated ſocket, which is ſeparated from the next by an intermediate thin, ſpongy partition. Moreover, the gum cloſely embraces the neck of the tooth.

The Teeth are deſtined for chewing; for the *Inciſores* cut and divide the food; the *Canini* tear it into ſmaller pieces, and the *Molares* break and grind it. Beſides, the teeth render the pronunciation of ſome letters

that enamel is continued even over the fang, though it be much thinner there (*Praelect. in Inſt. Med. Boerh.* § LIX.). The lateſt and moſt accurate experiments of Mr. Hunter prove, that the most ſubtile injections never reach the enamel; though Ruyſh (*Theſaur.* X. *No.* 27.) and Monro (Oſteol. p. 155.) had both ſuppoſed it poſſeſſed of veſſels (See the ſequel of Note 81).

If enamel be broken, it appears as if it conſiſted of fibres. Theſe fibres, which anatomiſts had long ſince obſerved, are ſaid by De la Hire to be ſhort, cloſely compacted together, and placed perpendicularly to the interior ſubſtance of the tooth (*Mem. de l'Acad. des Sciences, An.* 1699.); Bertin found them variouſly inclined (*Oſteol.*); Havers ſays the fibres lie obliquely on the tooth (*Oſt. Nov. p.* 79.); and Mr. Hunter, whom I take to be in the right, remarks that they are directed from the circumference of the tooth to the center (p. 33.)

Enamel is ſo hard as ſcarcely to be filed. It ſtrikes fire with ſteel.

The Chemical *Analyſis* of the Teeth and of the Enamel is to me a *Deſideratum.*

(79) The teeth frequently become looſe and fall out, in ſcurvy, mercurial ſalivation, &c. they fall out by boiling and maceration; the *molares* excepted; and they have a motion in their *alveoli* naturally. Ought we not rather to call their connection *Syſſarcoſis?*

more

more diſtinct ([80]), and are an ornament to the face.

There remain even now to be particularly noticed of the teeth the circumſtances which follow, *viz.*

In *foetus*, and children ſoon after birth, a double order of teeth is hidden in the *alveoli* by the gums, and ſeparated one from another by a thin bony *lamella.* The ſuperior protrudes through the gums ſix or ſeven months after birth; ſometimes, however, not till a whole year hath elapſed; but in ſuch a manner, that the *Inciſores* firſt, one or another of the *Molares* next, and laſt of all the *Canini* are formed.

The Teeth above-mentioned are called *Primary* or *Milk-teeth* ([81]): they gradually fall out

([80]) Perhaps the *Inciſores* only render the voice more clear and ſonorous; for the change is remarkable when theſe, or any of them, are removed. Children are ſaid to liſp, till theſe are formed; and old men who have loſt them, mouth every thing they ſay, and experience a greater difficulty as theſe and the alveolar proceſſes are removed. The particular letters which cannot be pronounced but for the teeth, are ſaid by Bartholine to be T and R *(Anat. Reform.)*; to which Diemerbroeck adds C, D, L, X, Z *(Anat. C. H.)*.

([81]) Theſe *Primary*, *Temporary*, or *Milk-teeth*, as they are called, differ from thoſe which ſucceed them in number, figure, and ſize. There are only twenty; there being no *Bicuſpides.* The *Inciſores* are formed generally before the ninth month after birth; but all the teeth are commonly ſeen about the twentieth or twenty-fourth month. The figure and ſize of the milk teeth was ſaid to differ from that of the ſecondary teeth; becauſe of the circumſtances

out about the ſeventh year, and are ſucceeded by the other order, which till now had been concealed

circumſtances attending the *Shedding of Teeth*; it was imagined that the ſecondary teeth are rendered broader and thicker from the reſiſtance given them in removing the primary teeth. This is merely hypothetical, as Mr. Hunter obſerves; for the ſecondary *bicuſpides* are leſs than the primary (p. 106.). The more rational account of the ſhedding of the teeth is likewiſe given by Mr. Hunter; he avers that the ſecond ſet of teeth do not puſh out the firſt, but that the ſecond ſet is formed in diſtinct ſockets, and that the fangs of the firſt ſet gradually decay, as the ſucceeding teeth grow. That this doth not depend on the conſtant preſſure from below, is evident from this, that the decay of the fangs of the firſt ſet is always in proportion to the decay of the firſt ſockets, and the new teeth ariſe in new, diſtinct ſockets. Nay, the ſecondary teeth are encloſed in their *alveoli* after the primary ones have fallen, and conſequently are not injured by preſſure (p. 98.).

Mr. Hunter never ſaw but one inſtance of a third ſet of teeth, in the ſame perſon, and in that two fore teeth appeared in the lower jaw; he thinks a new alveolar proceſs muſt neceſſarily be formed in ſuch caſes; and ſays the age at which this third dentition happens is about ſeventy (p. 84.). It certainly happens afterwards, if one can ſafely believe the reports of learned men; at eighty, ninety, a hundred, and a hundred and twenty (Van Swieten, *Com. in Aph. Boerh. Tom.* IV. *p.* 42.). See alſo Sennertus (*Prax. Med. Lib.* II. *P.* I. *Cap.* 10.) and Dodonaeus (*Obſ. Med. p.* 291.). And we have an inſtance in the Lond. Med. Obſ. and Inq. Vol. 3. of a third ſet in a child only five years old. But the third ſet was only in the upper jaw.

Of the Formation of the Alveoli, and Teeth, their Bony Part and Enamel.

In foetus of three or four months old, there are no bony partitions between the anterior and poſterior ſurfaces of the

concealed in the bottom of the *alveoli.* These latter teeth usually remain the rest of one's life-

the alveolar process; but instead of them, there are ridges across the bottom of the longitudinal groove, with intermediate depressions, marking the beginnings of future *alveoli.*

There is no distinct canal yet, for the blood-vessels and nerves of the lower jaw; but a mere groove at the bottom of the alveolar cavity (See Note 70).

The ridges which are to form the partitions of the *alveoli* extend upwards on the internal surfaces of the anterior and posterior plates of the alveolar process, and shoot across from the sides, forming arches: and as the intercepted cells become deeper, their apertures contract, and are at length almost closed. This contraction seems to answer a good end; it supports the gum till the teeth are come through. The *alveoli* of the three last grinders are formed after a different manner. They are formed in the root of the coronoid process of the lower jaw, and in the tubercles of the upper jaw; so that they come forwards in proportion as the body of the lower jaw comes forwards, from under that process.

So much for the *alveoli:* we are next to speak of the *Teeth*; the rudiments of which, in foetus of three or four months, are, according to Mr. Hunter, four or five little pulpy substances, contained in the beginnings of the *alveoli* (p. 77.). Each pulp is of a firm texture, transparent and very vascular. It is attached only at the bottom of the cavity which forms the *alveoli*, and there the vessels enter. The pulp having become almost as large as the body of the tooth, ossification commences, but the pulp does not immediately cease growing (p. 86 and 87.).

The pulpy substances are loosely invested with a thin *capsula*; which if sought for, in a recently born child, is found easily separable into two membranes; the external of which is soft, spongy, but not vascular; it adheres to the gum where it covers the *alveoli*; the internal membrane is firmer and very full of vessels; which it receives from those that go to the pulp and body of the

 tooth

life-time, unless they be affected with disease. The two last of this latter order, which appear
the

tooth (p. 87.). Between this pulp and membranous capsule, there is a liquor like *synovia*.

The *capsula* is necessarily perforated when the tooth has come through the gum; and as its lower part encompasses the neck of the tooth, it is gradually removed as the tooth is completed (p. 87.).

Now the points of ossification appear in one, or in many parts, on the surface of the pulp. If there be only one point of ossification, it enlarges till the tooth is formed. If there be many, they all increase, till they meet and unite; when they become as one point of ossification, extending and covering the whole pulp (p. 88.). In the progress of ossification, that part of the pulp is always the more vascular, which is covered with bone; though the bony part cohere so slightly to the pulp as to be easily separated from it, without any seeming laceration (p. 89.).

The pulp, which bears a resemblance to the body of the tooth, being covered with bone, contracts, and thus forms the neck; after which the fang begins to be formed, and raises the body of the tooth against the top of the socket, which is consequently rendered thin; and at length, both it and the gum which covered the socket, are removed (p. 89.). There is no part of the pulp which corresponds with the fang of a tooth; but we can readily conceive how that defect is compensated: for as the cavity in the body of the tooth is gradually lessened, a part of the pulp is gradually forced out, and elongated and formed into a fang. As this fang passes deeper into the socket, the tooth is proportionally protruded. But the socket also accommodates itself to the beginning of the fang, or neck of the tooth; it contracts around the incipient fang, and passes along with it; whilst the *alveolus*, which contained the body of the tooth, is contracted in its whole length, over the fang; or is absorbed, to make room for another (Hunter ibid.).

There is only one cavity in the body of any tooth; and if it have more fangs than one, the ossification shoots
from

the lateſt, are called *Dentes Sapientiae*, as already obſerved.

Hitherto,

from oppoſite ſides; both or all meeting and dividing the opening of the cavity in the middle of the tooth, from each of which diviſions the fangs grow.

If there be three fangs, oſſification proceeds from three points of the circumference, which converge to a center, ſo as to make three apertures to the cavity in the body of the tooth; and from the edges of theſe apertures the fangs are formed.

The *Enamel* is not formed before the bony part of a tooth. Mr. Hunter ſays,—"There is another pulpy "ſubſtance oppoſite to that which we have deſcribed; it "adheres to the inſide of the *capſula*, where the gum "is joined to it, and its oppoſite ſurface lies in contact "with the baſis of the above deſcribed pulp, and after- "wards with the new formed baſis of the tooth; what- "ever eminences or cavities the one has, the other has "the ſame, but reverſed, ſo that they are moulded ex- "actly to each other (p. 94.)."—Again, "The beſt "time for examining it is in a Foetus of ſeven or eight "months old. It is thinner than the other pulp, de- "creaſes as the teeth advance, but does not ſeem to be "poſſeſſed of many veſſels (p. 95.)."—As ſoon as the bony part of a tooth is formed, it is covered with a thin coat of enamel, which encreaſes in thickneſs, till ſome time before the tooth begins to cut the gum. The enamel is perhaps ſecreted from the pulp above deſcribed, and the *capſula* of the body of the tooth; after it is ſecreted it cryſtallizes; hence we ſee the cauſe why it appears ſtriated when broken (p. 95 and 96.). Where the enamel is firſt formed there it is always thickeſt; and it is thinneſt at the neck; for there is no enamel on the fang (p. 96.).

The *Cavity of Teeth*, which is like that of the body ſuperiorly, but gradually contracted inferiorly towards the opening at the extremity of the fang, is not cellular, nor does it contain marrow, but is ſmooth, and filled with blood-veſſels, and nerves, connected together by cellular ſubſtance.

The

Hitherto, we have particularly confidered the bones of the head; it is now convenient to recapitulate, as briefly as may be, the hiftory of fome of its parts taken conjointly.

Of the Noftrils.

The *Organ of Smelling*, which is univerfally called the *Nofe*, is compofed of the fourteen following bones, viz.

1. *Offa Nafi*
2. *Offa Maxillae Superioris*
3. *Os Frontis*

Superiorly, *Internally* and Laterally,

4. *Os Ethmoides.*
5. *Offa Lacrymalia*, and

Inferiorly, Internally and Pofteriorly, the *Offa Maxillae Superioris*; and

6. *Offa Palatina*

The *Blood-veffels* come from the fuperior and inferior maxillaries.

The *Nerves* come from the fecond and third branches of the *Trigemini*, or Fifth Pair. Mr. Hunter was never able to trace the nerves diftinctly even to the beginning of the cavity of the teeth (p. 42.): he acknowledges that the nerves of the teeth have an exquifite fenfibility, more exquifite than other nerves; but he believes that the fenfations of heat and cold are fo extremely intenfe and momentaneous, becaufe the teeth communicate heat quicker than other parts of the body (p. 114.).

There feem to be no *Abforbent Veffels* in the bony fubftance of the teeth; for if an animal, e. g. a pig, be fed alternately with madder and the ordinary food, the tinge will not be removed after ever fo long a time; nor will any parts be tinged, except fuch as are formed while the animal feeds on madder (Hunter, p. 39.).

7. *Os*

7. *Os Sphoenoidale*
8. *Os Vomer*, which divides the nofe into two cavities, in which are the
9. *Offa Spongiofa Inferiora.*

The Nofe itfelf is terminated anteriorly, in the face, and pofteriorly in the fauces, by two orifices, which are named the *Anterior* and *Pofterior Orifices of the Nofe*; the latter are alfo diftinguifhed by the defignation of *Choanae Narium*. Thefe cavities are much enlarged by the frontal, fphoenoidal, fuperior maxillary, and ethmoidal finus.

Of the *Orbits.*

The two *Orbits*, which contain the eyes, are compofed of feven bones, viz.

Inferiorly, the *Os Jugale* and *Maxillare Superius.*

Superiorly, the *Os Frontis.*

Internally, the *Os Lacrymale*, *Ethmoidale*, and *Palatinum.*

Externally, and inferiorly, the *Os Sphoenoidale.*

Befides, we ought to remark the two *Orbitar Arches*; the *Superior*, which is continued from the *os frontis*, and the *Inferior* from the *os jugale* and *maxillare fuperius*. At the meeting of thefe arches, internally and externally, there are formed *Angles*: the greater of which is the *Internal Angle*.

The *Cavities* and *Foramina* of the Orbits are

1. The *Depreffion*, immediately over the external angle, for the lacrymal gland.

2. The *Little Pit*, ſuperiorly in the internal angle, which concurs to form the *trochlea*.

3. The *Cavity* in the internal angle, for the lacrymal ſac, formed of the *os lacrymale* and naſal apophyſis of the *maxilla ſuperior*.

4. The *Naſal Canal*, which is a production of the lacrymal cavity (3.), and opens into the noſtrils under the inferior ſpongy bone.

5. The *Superior Orbital Chink* or *Fiſſure*, ſituated at the bottom of the orbit, is formed of the cuneiform bone. The third and fourth pair of nerves, and the firſt branch of the fifth pair, and the ſixth pair, and the ophthalmic artery, all paſs through it.

6. The *Inferior* or *Sphoeno-maxillary Fiſſure*, formed of the cuneiform bone, the ſuperior maxillary bone, the palatine bone and the zygomatic bone. Blood-veſſels and nerves paſs through this fiſſure.

7. The *Optic Foramen*, in the bottom of the orbit, formed in the ſphoenoidal bone, through which the optic nerve paſſes.

8. The *Superciliary Foramen*, which is oftener a mere notch, on the internal part of the ſupra-orbital arch, and is the paſſage of the frontal nerve.

9. The *Internal Orbitar Foramen*, or *Naſal Foramen of the Orbit*, placed in the internal part of the orbit, between the lateral *lamina* of the ethmoid bone and the *os frontis*. The naſal branch of the ophthalmic nerve paſſes through

through this *foramen* into the cavity of the nose.

10. The *Posterior Infra-orbital Foramen*;—in the posterior part of the orbit, there is a margin called the *Infra-orbital Canal*, which ends anteriorly, in

11. The *Anterior Infra-orbital Foramen*, which is under the inferior orbital arch. The infra-orbital nerve passes into the face through these *foramina*.

Of the Cavity of the Mouth.

The *Cavity of the Mouth* is formed by five bones, viz.

1. The Two *Ossa Maxillaria Superiora*,
2. The Two *Ossa Palatina*,
3. The *Os Maxillare Inferius*, and
   Thirty-two Teeth.

Of the Cavity of the Fauces.

The *Cavity of the Fauces* consists of ten bones, viz.

Superiorly, the *Cuneiform Apophysis* of the *os occipitis*,

Inferiorly, the *Os Hyoides*,

Anteriorly, the *Pterygoid Apophyses* of the *os sphoenoidale*, and the *ossa palatina* and *os vomer*,

Posteriorly, the three superior *Cervical Vertebrae*,

Laterally, on each side, the *Petrous Apophyses* of the temporal bones.

The *External Eminences of the Head* are the following, viz.

In the *bones of the Skull,*

Two *Maſtoid* Apophyſes,
—— *Styloid* ———,
—— *Spinous* ———,
—— *Pterygoid* ———,
—— *Zygomatic* ———,
—— *Articular Condyles* of the *os occipitis,*
The *Occipital Eminence* and *Spine.*

In the *bones of the Face,*

Two *Naſal* *Apophyſes,*
—— *Orbital* ———,
—— *Palatine* ———,
—— *Maxillary* ———,

The two laſt apophyſes form the two arches, in which the teeth are contained; at their poſterior extremity there is the *Maxillary Tuberoſity.*

The *Naſal Spine,*

The Two *Articular Condyles* and *Coronoid Proceſſes* of the lower jaw.

To the *External Foramina of the Head* are referred,

Two *Foramina of the os occipitis,*

———— *in the articular condyles of the os occipitis,*

———— *between the* ſtyloid *and* maſtoid apophyſes,

———— poſteriorly in the maſtoid apophyſis.

Two *Meatus Auditorii Externi* in the *oſſa temporum,*

Two *Euſtachian Tubes* in the *oſſa temporum*,
Two *Pterygoid Foramina* in the *os ſphoenoidale*,
—— *Poſterior Palatine Foramina* in the ſame bone,
—— *Foramina* between the *os cuneiform* and *palatinum*,
—— *Anterior Palatine Foramina*, in the ſuperior maxillary bones,
—— *Foramina* anteriorly, *under the inferior orbital arch.*
———————— *in the inferior part of the orbits*,
———————— *in the zygomatic bones*,
—— *Superciliary Foramina*, or Notches in the ſupra-orbitar arches.
—— *Naſal Foramina*, in the naſal bones,
—— *Anterior*, and
—— *Poſterior Foramina in the inferior maxillary bone.*

There are *Various Foramina* in the zygomatic bones; *Various Foramina* in the naſal bones.

The *Internal Eminences of the Skull* are the following, viz.

The *Frontal Spine* of the *os frontis*; the *Criſta Galli* of the *os ethmoides.*

The *Two Leſs Alae* of the Sphoenoid bone,

The *Four Ephippial Apophyſes* of the Sphoenoid bone,

The *Two Petrous Apophyſes* of the temporal bones,

The

The *Internal Crucial Spine* of the *os occipitis*,

The *Internal Foramina* and *Cavities* of the ſkull are

The *Excavation* in the *ſella turcica*, the ſeat of the pituitary gland,

The *Eight Depreſſions* for the brain and *cerebellum.*

The *Furrow* for the longitudinal ſinus of the *dura mater*, in the *os frontis* and *oſſa ſincipitis.*

The *Two Furrows* for the lateral *ſinus* of the *dura mater*,

The *Various Depreſſions* and *Furrows* made by the arteries,

Different ſmall Foramina in the ethmoid bone,

Two Foramina, for the optic nerves, in the ſphoenoid bone,

The *Superior Orbital Fiſſure*, and

The *Inferior* ———————, both in the ſphoenoid bone,

Two *Foramina Rotunda* in the ſphoenoid bone,

——————— *Ovalia* in the ſame bone,

——————— near the ſpine of the ſame bone,

——————— *Lacera*, between the petrous apophyſis and the *os occipitis*,

———————, in the petrous apophyſes of the temporal bones, for the carotid arteries.

Two *Meatus Auditorii Interni*,

Two

Two *Foramina* anteriorly, in the articular condyles of the *os occipitis.*

The *Great Occipital Foramen.*

Of the Os Hyoides.

The *Os Hyoides* is a ſmall, ſingle bone, placed in the anterior part of the cavity of fauces, between the baſe of the tongue and the head of the *aſpera arteria.*

Its *Figure* is ſemilunar.

It is *diviſible* into

A Body, and
Two Larger, and *Two Leſs* } *Cornua.*

Its *Body*, or *Baſe* is the broad, thick, and middle portion, which is unequally protuberant forwards, but excavated backwards. It has

A Superior and *An Inferior Margin*; it has an *External* and an *Internal Surface*; and a *Right* and *Left Extremity*, for the attachment of the larger *cornua*.

The *Larger Cornua* are connected, on both ſides, by their *roots*, to the body of the bone; they aſcend at their *apex*, towards the ſtyloid proceſs of the *os temporale*, and are connected to it, and to the *cornua* of the thyroid cartilage poſteriorly, by ſyndeſmoſis. Their *middle part* is broad and turned ſomewhat downwards.

The *Leſs Cornua* may be ſeen at the connection of the larger *cornua* with the body of

of the bone. They are united to the baſe by a ſub-cartilaginous ligament.

The *Os Hyoides* is connected by ſyndeſmoſis and ſyſſarcoſis: 1. with the head of the *larynx*; 2. with the ſtyloid proceſs of the temporal bone; 3. with the lower jaw; 4. with the *ſcapula*; 5. with the *ſternum*; 6. with the tongue.

Its *Uſe* is to ſupport the tongue; it is alſo ſaid to be deſtined for deglutition, and the articulation of the voice ([82]).

SECTION II.

The Bones of the Trunk.

We have already divided the Trunk, which is the ſecond part of the ſkeleton, to which all the bones placed between the head and the extremities are to be referred, into

The *Spine*,

The *Thorax*, and

The *Pelvis*.

We noticed alſo, at the ſame time, of how many bones each of theſe is compoſed, and ſhall now treat of them individually.

([82]) At birth, the *Os Hyoides* has always three diſtinct points of oſſification, its figure being the ſame as in adults. It has no point of oſſification till after the eighth month (Neſbitt). Kerckringius, therefore, was much miſtaken in averring that—" not even its cartilage is viſible in foetus (*Oſteog. Foet. C.* II.).

THE FIRST ORDER.

Of the Spine.

THAT bony column, which extends from the condyles of the *os occipitis* to the *os sacrum*, is called the *Spine*.

The ſeries of bones, which makes the ſpine, reſembles a column anteriorly round, but unequal poſteriorly, becauſe of many eminences and cavities (83). Internally, it is hollow. Laterally, it has many *foramina* penetrating into its internal cavity.

The Bones which compoſe the ſpine are in *Figure* very like one another. They differ in *Size* (84); they are conjoined together by inter-articular cartilages, or by ſynchondroſis; and they are diſtinguiſhed by the proper name of *Vertebrae* (85).

The

(83) The Spine is not ſtraight, but incurvated ſo as to reſemble, in ſome manner, the italic letter *ſ*. It is hard to trace likeneſſes in Anatomy. Superiorly it is drawn backwards, by muſcles, and formed into a curve for ſupporting the *oeſophagus*, &c. In its middle, it is alſo bent backwards, to contain the heart and lungs. Afterwards it is bent forwards, to ſuſtain the abdominal *viſcera*; and it again goes backwards, to enlarge the *pelvis*. As Monro obſerved (Oſt. p. 166.).

(84) They are ſmaller above, but more ſolid: and they are larger below, but leſs ſolid. So that the *os ſacrum* is ſpecifically the lighteſt of all the *vertebrae*: and it is the lighteſt of all the bones of a ſkeleton.

(85) The word *Vertebra* comes from the Latin *Verto*, *to turn*; becauſe, as Voſſius ſays, "*Vertebrarum beneficio*

The intire ſpine conſiſts of twenty-four *vertebrae*, which are ſubdivided into *three orders*. The uppermoſt are called the *Vertebrae* of the Neck, the twelve following, *Vertebrae* of the Back, and the five lowermoſt, *Vertebrae* of the Loins. Some authors refer hither the nine *vertebrae*, conſtituting the *os ſacrum* and *os coccygis*, calling them, for the ſake of diſtinction, *Falſe* or *Spurious Vertebrae*; but we refer theſe to the *Pelvis*, and ſhall conſider them whilſt we treat of it.

Each *vertebra* is divided into

1. Its *Superior* and *Inferior Surface*,
2. Its *Superior* and *Inferior Margin*,
3. Its *Body* and *Seven Proceſſes* or *Apophyſes*.

The *Body* of each *vertebra*, which is the foremoſt and thickeſt part, has circumference anteriorly, more or leſs round, and a great notch, poſteriorly.

The upper and under ſurface is alike covered with cartilage, compoſed of layers, and ſeemingly participating of a ligamentous nature (86).

The

ficio homo ſe vertere, flectereque poſſit (See *Verto* in his *Etymolog. Ling. Lat.*).

(86) This is preciſely what the intervertebral ſubſtance ſeems to be, for it has no affinity with cartilage in other parts of the body. It conſiſts of concentric circles, which are more ſolid and elaſtic as they are nearer the circumference. The circles are nearer one another as they approach nearer the center of the ſurface of the body of the *vertebra*; and in the center, and for ſome ſpace around it, they ſeem to be diſſolved into a fluid, not much unlike *ſynovia*. Do this liquor anſwer the purpoſe of a pivot, in the various motions and concuſſions of the ſpine, as ſome phyſiologiſts have imagined?

The

The *Seven Processes* are,

1. *Two Superior, obliquely ascending*; one of which is situated superiorly, on each side.

2. *Two Inferior, obliquely descending*; of which one is placed inferiorly, on each side, all being equally covered with cartilage (87).

3. *Two Transverse Processes*; one on each side of the angle; and

4. The *Spinous Process*, extending posteriorly, and ending in an epiphysis. These

The Intervertebral Substance is thickest in the loins, and thicker between the inferior than the superior dorsal *vertebræ*.

Mr. Wasse observed long since that the same individual is higher, from four to five lines, in the morning than in the evening (*Philos. Trans.* No. 383.), and this has lately been confirmed in France (*Sabatier De l'Ost. p.* 101. *Tom.* I.).—This may easily be accounted for, from the pressure and consequent absorption in the day; and from the removal of pressure, the expansion of the intervertebral substance, and the greater accumulation of fluids in the night.

Some say we become taller after eating plentifully, and shorter after fasting. This the Abbe Fontenu thinks to depend in part, if not wholly, on the various thickness of the intervertebral substance (*Hist. de l'Acad. des Scien.* 1725.).

Bernard Gengha is said by Sabatier (*De l'Ost. p.* 101.) to have long ago assigned the crookedness of the spine in old people, to the exsiccation and diminution of the intervertebral substance.

(87) Sabatier has properly enough observed (Ibid. p. 99.), that these, and the former, ought rather to be called *articular* processes or apophyses, than *oblique*, as they are termed by Leber and most Anatomists; because they serve particularly for the articulation of the true *vertebrae*. Monro called them *Oblique* (Osteol. p. 170.).

last

laſt proceſſes, taken collectively, conſtitute the *Spine*, properly ſo called.

The *Foramina* and *Cavities* are

1. The *Great Foramen*, which concurs to form the great canal, continued through the whole ſpine, in which the ſpinal marrow is contained. This canal is larger in the neck and loins than in the back.

2. *Four Notches* ſo placed, that on each ſide, one is ſuperior, and another inferior. The latter unite with the ſuperior, or with the inferior of the contiguous *vertebrae*, and thus form the *Lateral Foramina of the Vertebrae*, through which the dorſal nerves paſs. Theſe *foramina* are larger in the neck and in the loins; but in the back they are ſmaller, and ſituated more poſteriorly.

The *Subſtance* of the bodies of the *vertebrae* is ſpongy, and pervious from numerous *foramina*; that of the proceſſes is compact.

The *Connection* of the Spine with the head is by ginglimus; with the *os ſacrum* by ſynchondroſis. The *Vertebrae* are joined to one another, with their oblique proceſſes, by diarthroſis; their bodies are conjoined by ſynchondroſis. Moreover, the dorſal *vertebrae* are united to the ribs.

The *Uſe of the Spine*, is to retain the body erect, and yet to leave a neceſſarily free motion; to ſupport the head and trunk; to contain and preſerve the ſpinal marrow; and to ſupply a paſſage, by its lateral *foramina*, for the nerves of the ſpinal marrow.

Of

Of the Vertebrae considered particularly.

The *Vertebrae of the Neck* are the seven first and uppermost of the spine ([83]). They differ from all the rest.

1. Their *bodies*, especially forwards, are smaller and flatter.

2. The *superior surfaces* of the five inferior cervical *vertebrae* are hollowed transversely, from one side to another, but the *inferior surfaces* from behind forwards.

3. The *cartilages* interposed between these, are thicker than those between the dorsal *vertebrae*.

4. The *spinous processes* of the two first *vertebrae* are almost straight, but those of the others are successively inflected downwards, from the third. Their points are forked, and they are shorter than the spinous processes of the other *vertebrae*.

5. Their *Oblique Processes* are generally more oblique than those of the other *vertebrae*; and they are so covered with cartilage, that the inferior oblique processes of a superior cervical *vertebra* have always a superficial cavity for the reception of the superior oblique process of an inferior cervical *vertebra*.

([83]) Some authors assert, that in long necks there are sometimes eight *vertebrae* (*Verheyen Anat. C. H. p.* [illegible]): and others say that, in people who have short necks, and are hence accounted predisposed to Apoplexy, there are oftentimes only six *vertebrae* (Cullen's Lectures, M. SS.)

It is probable that the bodies of the cervical *vertebrae* are flattened anteriorly by the *pharynx* and *oesophagus*.

6. The *Tranſverſe Proceſſes*, the firſt and laſt only excepted, are the ſhorteſt ; their origin is double, but they end in an acute point. Beſides, they have a particular *foramen*, which is a paſſage for the vertebral arteries and veins.

Independent of theſe more general obſervations, we muſt add the following particulars concerning the firſt, the ſecond, and the ſeventh *vertebra* of the neck : viz.

The *Firſt Vertebra* is called *Atlas*, becauſe it ſuſtains the head. This *vertebra* has no ſpinous proceſs, which would prevent bending the neck backwards, but its place is ſupplied by a ſmall eminence. The great *foramen* of this is much larger than that of any other *vertebra.* Its body, which is ſmall and thin, is nevertheleſs firm and hard. It is ſomewhat like a ring, diſtinguiſhed into its *Great Anterior Arch*, which ſerves in the place of a body, and its *Small Poſterior Arch.*

On the *Anterior Arch* externally, is placed an eminence, and internally, a depreſſion inveſted with cartilage, which receives the *dentiform* or *odontoid* proceſs of the ſecond *vertebra.* There is an eminence and a cavity on both ſides, to the former of which the tranſverſe ligament is affixed, to keep the dentiform proceſs in its proper place.

The *Tranſverſe Proceſſes* ariſe by a broader beginning from the middle of the ſides, are much longer than thoſe of the ſix inferior *vertebrae*, and end in a more obtuſe point.

point. Their *foramina* are in a perpendicular direction, and they have many depreſſions from the various muſcles affixed to them.

Superior Oblique Proceſſes it has not. But inſtead of them, there are two cavities lined with cartilage, which receive and unite, by ginglymus, with the articular condyles of the *os occipitis.* The inferior proceſſes are placed under and oppoſite the ſuperior, their cavities having a ſimilar relation to one another, though ſmaller and connected with the ſuperior oblique proceſſes of the ſecond cervical *vertebra.* Under the ſuperior oblique proceſſes there is a furrow, through which the arteries and veins of the head paſs.

This *Vertebra* is joined ſuperiorly to the head, by ginglymus; and inferiorly to the ſecond cervical *vertebra*, by means of the inferior oblique proceſſes and the dentiform proceſs, by lateral ginglimus.

The *Second Vertebra* of the Neck is called *Axis* or *Epiſtropheus.* It has a body which exceeds in thickneſs and ſtrength the other cervical *vertebrae.* Its *Tranſverſe Proceſſes* are very ſhort, oblique, and perforated. Its *Spinous Proceſs* is broad, deeply bifurcated, and divided above by an acute eminence into two lateral parts, and below by a line into two cavities. The *Dentiform Proceſs* is on the ſuperior ſurface of the body of this *vertebra* covered with cartilage, entering into a cavity of the firſt cervical *vertebra*, and joining to it by the tranſverſe ligament,

 and

and to the great occipital *foramen*, by two other ligaments, fixed laterally.

The *Body of the ſeventh of the cervical vertebrae* is broader than all the reſt. Its *Inferior Surface* is almoſt flat. Its *Spinous Proceſs*, which is almoſt ſtraight, and the longeſt of all, is ſeldom forked. Sometimes there is a *foramen* in the *Tranſverſe Proceſſes*, which is the paſſage of the poſterior cervical artery ([89]).

Of the Vertebrae of the Back.

Next to the cervical are placed the *Twelve Dorſal Vertebrae.* Theſe increaſe in ſize as they

([89]) Except the firſt cervical *vertebra*, which conſiſts of two bones only, at birth, and the ſecond and laſt, which conſiſt of more than two, all the *vertebrae* are compoſed of three diſtinct parts, connected together by cartilage.

The anterior part of the firſt *vertebra* is entirely cartilaginous, and its two lateral parts are united by cartilage.

The ſecond *vertebra*, called *Dentata*, becauſe its dentiform proceſs, is at birth always compoſed of as many as four parts, and oftentimes of five or ſix. One is the body, on which ſtands the tooth-like proceſs, ſeparated only by cartilage. Two lateral parts connected at their poſterior ends by cartilage. On each ſide of the body, at the root of the tranſverſe proceſſes anteriorly, there is likewiſe a point of oſſification, but this is frequently on one ſide only.

The laſt cervical *vertebra*, as above obſerved, has more than two parts at birth. It has a little bone on the anterior ſide of its tranſverſe proceſs (Neſbitt's Hum. Oſt. p. 102.).

The ſpinous proceſs is wanted in all the *vertebrae*, at birth (Kirkring. *Oſt. Fœt.)*, but its place is ſupplied by cartilage.

they are lower. Their *Bodies* are thick and broad, and their *Superior* and *Inferior Surfaces* are flatter, and more excavated backwards than thoſe of the neck. On each *ſide* of the bodies, near the tranſverſe proceſſes, in the ſuperior and inferior margins, there is a *Concavity* lined with cartilage; the two inferior concavities together with the two ſuperior of the ſubſequent *vertebra* forming a *Notch*, to which the greater poſterior extremity of the ribs is attached, hence each rib is always received between the bodies of two *vertebrae*.

The *Tranſverſe Proceſſes* extend rather backwards, and are leſs when they occupy a lower place. In the extremities there are *Articular Cavities* lined with cartilage for the reception of the ſmaller poſterior extremities of the ribs. But theſe cavities are oftener wanting in the two laſt *vertebrae* of the back.

The *Oblique Proceſſes* have a direction nearly perpendicular. The cartilaginous ſurface of the ſuperior oblique proceſſes extends forwards and is a little more broad, but the ſurface of the inferior is ſomewhat hollowed, and extended backwards.

The *Spinous Proceſſes* of the four ſuperior dorſal *vertebrae* are not ſo long, but they are broader and ſtraighter than of the following. On the contrary, the ſpinous proceſſes of the inferior *vertebrae* of the back, are ſharp above, and thick below, and thin laterally; they tend more obliquely downwards, and

are placed clofely over one another. The *Spinous Proceſſes* of the eleventh and twelfth dorſal *vertebrae* are broad again, but they are ſhort (90).

Of the Vertebrae of the Loins.

The *Five Lumbar Vertebrae*, which are placed immediately after the Dorſal, are the laſt and the largeſt of the true *vertebrae.*

Their *Bodies* are larger, thicker, and broader than the bodies of all the reſt.

Their *Surfaces* are ſmooth, but hollow in the middle.

Their *Spinous Proceſſes* are laterally broad, but ſuperiorly ſharp, and divided inferiorly by a prominent *line* into two *labia*. They are erect, having a thick extremity.

Their *Tranſverſe Proceſſes* are ſmaller and longer than thoſe of the lumbar *vertebrae*, the firſt and laſt only excepted, of which they are commonly ſhorter. The direction of theſe is ſtrait, they are flat poſteriorly, and ſmooth anteriorly.

Their *Oblique Proceſſes* are all oblong. The ſuperior are concave, the inferior are convex; they have *concave ſurfaces* covered with cartilage turned inwards, and *convex ſurfaces* turned outwards.

The *Inter-articular Cartilages* are thicker between theſe than between the other *vertebrae.*

(90) There is nothing very particular in the dorſal *vertebrae* at birth. The parts where the ribs are articulated are cartilaginous.

The

The *Large Foramina* in the middle of the bodies of these *vertebrae* are larger than those in others; they are smooth before, and almost angular behind ([91]).

Of the Bones of the Thorax.

The *Thorax* or *Breast* is another part of the trunk, which resembles an arched bony cavity. It is narrow above, broad below ([92]), flat anteriorly, hollow posteriorly, in the direction of the cavity, and convex laterally ([93]).

([91]) These *vertebrae* also consist of three parts, and, like the dorsal, differ but little from those of adults.

The last Lumbar *Vertebra* has a round protuberance anteriorly, which is partly formed by the superior part of the *os sacrum*, called the *Promontary of the os sacrum* (See note 102.).

([92]) It is observed particularly by Albinus, that the very bottom of the cavity of the *thorax* is more narrow and contracted than it is some way above (*De Ossibus*, § 169.); and that the inflection of the bodies of the *vertebrae* forwards lessens this cavity posteriorly.

([93]) The Figure of the Breast is various. In some it is large and elevated, in others, it is small and flattened. Compression, especially during Infancy, may alter the natural Form of the Breast many ways: thus Stays, tightly laced, alter the figure of the breasts of women, and change the position of the thoracic *Viscera*; often impeding their functions, and sometimes occasioning the disease called a Consumption. Professor Sommering, of Mentz, has written an excellent Essay on the many Injuries done by confining the Bodies of Children in any manner, and on the inconveniences of Stays to pregnant women. The Book is published at Leipsic.—Professor Witte, of Rostock, has also published an Essay, worthy of attention, in Answer to this Question, *Is a national Dress advantageous, or detrimental?* This was published at Copenhagen.

The Thorax is composed of thirty-seven bones: viz.

The *Twelve Dorsal Vertebrae* posteriorly.

The *Sternum* and the *Ensiform Cartilage* joined to it anteriorly.

The *Twenty-four ribs* laterally.

The *Dorsal Vertebrae* having been already described, we are next to treat

Of the Sternum.

The *Sternum* or *Breast-Bone*, which is placed longitudinally, between the cartilages of the true ribs, forms the anterior and middle part of the *thorax*.

Its *Substance* is spongy.

Its *Figure* is flat, unequally extended, and almost triangular. In adults, it consists of two parts, but in children it consists of more. The bounds of the parts composing it in children are marked by transverse lines in adults (94).

It is every where divided into the *Superior Part*, and into the *Inferior Part*, and its appendix.

(94) At birth the *sternum* is almost wholly cartilaginous, having more or fewer points of ossification. According to Doctor Nesbitt,—" scarcely two different *sternums* of the same age are ossified alike." (Hum. Ost. p. 113.). Bartholin enumerated eight bones of the *sternum*, which he says, coalesce afterwards in adult persons into three, or four or more (*Anat. Reform. Lib.* IV. *Cap.* XVIII.). Kirkringius thought the number never to exceed six (*Ost. Foet. C.* XV.). In a word, what I have already quoted from Doctor Nesbitt's Lectures is enough to reconcile these contrary opinions.

Into its *Internal* and *External Surface*,
——— *Right* and *Left Margin*,
——— *Superior* and *Inferior Extremities*.

The *Superior Part* is the broadeft and thickeft; inferiorly it is fmaller and thinner, refembling, in fome manner, a triangle, or an irregular quadrangle.

The *Superior Extremity of this part* is thicker than the inferior, and has a *Notch* in the middle; the *Inferior Extremity* is narrow, thin, and connected to the inferior part of the *fternum*.

The *Inferior Part* is generally the narrower, but it is longer than the fuperior; the *Superior Extremity of this part* is the narrower, and adheres to the inferior extremity of the fuperior part; but the *Inferior Extremity*, which is broad, is connected with the enfiform cartilage (95).

The *External Surface* of the *Sternum* is fomewhat convex; the Internal Surface is concave.

The *Two Lateral Margins* are oblique and thick, having an *articular cavity* lined with cartilage, to receive the clavicle. Under this articular cavity, there are many *Notches* which receive the cartilages of the ribs.

(95) There is moft commonly fome motion between thefe two parts, but it is more remarkable in children. Sabatier faw a child labouring of the fcrophulous *afthma*, in which the difficulty of breathing rendered the movement of the fecond part upon the firft very manifeftly upwards and downwards (*De l'Of. p.* 148.).

The

The *Lowermoſt Part* or the *Appendix of the Sternum* takes its name from its likeneſs to a ſword or dagger; and is accordingly called the *Enſiform Cartilage*, or *Proceſs*, or the *Xyphoid*, or *Sharply pointed Cartilage*. The *Figure* of this cartilage is various; ſometimes it is round, ſometimes acute, and not unfrequently it is deeply bifurcated. In ſome it inclines inwards, in others it inclines outwards, and it is oftentimes perforated. Nor is its length leſs variable; in one it may be only the third part of an inch; in another, a whole inch; and, in a third, as it more frequently is, an inch and a half (96).

The *Foramina* and *Cavities of this Bone* are,

1. A *Large Notch* in the ſuperior extremity, to make room for the *aſpera arteria*.

2. Two *Articular Cavities* of the lateral margins, receiving the clavicles.

3. *Seven Notches* or *Depreſſions* in the margin of each ſide, for the adheſion of the cartilages of the ſeven true ribs.

The *Sternum* is ſuperiorly connected with the clavicle by arthrodia, and laterally with the ſeven ribs by ſynchondroſis.

(96) This appendix of the inferior part of the *ſternum*, or third part, as ſome call it, retains the name of *Cartilage* even when it is completely oſſified. Monro, after treating largely on the inconveniences which are induced by a male-conformation of this part, refers his ſtudents to the celebrated pathology of Bonetus, intitled *Sepulchretum Anatomicum*, *Tom.* II. *Lib.* 3. *Sect.* 5. *Append. ad Obſ.* 8. *et Ibid. Sect.* 7. *Obſ.* 19 (*Oſteol. p.* 231.).

The *Use of the Sternum* is to ſupport the ribs, anteriorly to defend the heart and lungs; and to be a place of attachment for the *mediaſtinum*, the diaphragm, and ſome muſcles.

Of the Ribs.

The *Ribs* conſtitute the lateral parts of the *thorax*; they are bent like arches, and paſs obliquely and almoſt tranſverſely forwards and downwards, from the *vertebrae* to the *ſternum*; to which they cohere in ſuch a manner, that the extremities of the right and left ribs are always oppoſite each other.

The *Figure* of the ribs is ſemicircular.

There are twenty-four ribs naturally, twelve on each ſide (97).

They are generally divided into *True* and *Falſe* or *Spurious* Ribs.

(97) Monro has ſaid that eleven or thirteen have been frequently found on one ſide; and, that he had a ſkeleton, in which the fourth and fifth ribs of the left ſide were grown together for near an inch at their root, but dividing afterwards, became as the ribs of the oppoſite ſide, which are naturally formed (Oſteol. p. 216.).

Columbus (*De Re Anat.*) and Diemerbroeck (*Anat. C. H.*) only ſaw one inſtance in which there were eleven ribs on each ſide. Bartholin ſaw eleven on one ſide, and twelve on the other (*Cent.* 5. *Obſ.* 1.). Fallopius, and others have, more than once, ſeen thirteen ribs on each ſide (*Obſ. Anat.*).

Bartholin quotes one example in which the ribs were grown together, from the ſhoulders to the falſe ribs; and another, in which three were inſeparably united (*Anat. Reform.*).

The

The ſeven uppermoſt ribs on each ſide are called *True*; they are annexed to the *ſternum* anteriorly by means of their cartilages, and are connected with the ribs of the oppoſite ſide, making ſo many entire circles.

The five ribs which are placed below the former, on each ſide, and which do not reach as far as the *ſternum*, but are connected by their cartilages to one another, are called *Short* or *Spurious*. The two laſt of theſe are altogether unattached. The falſe ribs, therefore, do not unite and form entire circles, like the true ribs.

We may obſerve in each rib
Its *Body* or Middle Part,
Its *Anterior* and *Poſterior Extremities*,
Its *Superior* and *Inferior Margins*,
Its *External* and *Internal Surfaces*.

The *Body* of the firſt rib is ſhort, but broader than the bodies of the following. Its *Surfaces* are turned upwards and downwards, but its *Margins* are turned inwards and outwards, ſo that this very rib has a *Superior* and an *Inferior Surface*, and an *Anterior* and a *Poſterior Margin*. In the ſix inferior true ribs, the *Body* is narrower, and becomes longer as the ribs themſelves deſcend. The *Surfaces* are turned a little forwards and backwards; the *Margins* are turned upwards and downwards. The *Bodies of the Falſe Ribs* alſo decreaſe in order, the laſt being the ſhorteſt.

The

The proportion of the ribs, if we reſpect their length, is ſuch that the *True* ones continually encreaſe as they deſcend, but the *Falſe ones* decreaſe. The ſame may likewiſe be ſaid of the length of the cartilages. The Ribs are, all of them, at about the diſtance of a finger's breadth from one another, but they are nearer poſteriorly.

All the *Anterior Extremities*, a circumſtance already noticed, are more depreſſed than the poſterior; there is a ſmall depreſſion likewiſe in them, in which the cartilages are implanted.

The *Cartilages* of the ſeven ſuperior ribs extend from the ribs to the *ſternum*, and are received into as many ſmall *depreſſions* deſtined for the purpoſe. They differ one from another in length, breadth, flexibility, and curvature. The cartilage of the firſt rib is ſhort, and harder and firmer than the cartilages of the reſt. The other cartilages are more flexible. The three ſuperior follow the ſame direction as the ribs to which they belong; but the three following are always more curved, forming an angle, from which they aſcend to the *ſternum*, and come nearer one to another. The cartilages of the falſe ribs do not reach the *ſternum*, but the three firſt unite together and are united to the cartilage of the laſt true rib (98). The cartilages of the

(98) The cartilages of the ribs, as of other parts, are harder and more ſolid internally than externally. Veſalius obſerves, that their middle part frequently becomes

the fourth, and fifth true ribs are loose and unconnected, except with contiguous muscles and membranes.

All the *Posterior Extremities* are placed higher than the anterior, and are more or less remote from one another, in proportion to the various thickness of the *vertebrae*, to which they cohere.

The *Two Margins*, of which the *superior* is the thicker and rounder, and the *inferior* the *sharper*, have an *internal* and *external labium*. In the first and second true ribs, the superior margin is sharp and turned backwards; the inferior margin is rather round, and turned forwards.

The *Eminences of the Ribs* are,

1. The *Large Head*, which has a *small surface*, above and below, divided by an *eminent line*, covered with cartilage, entering into the articular cavities of the dorsal *vertebrae*. The head of the first rib, and of the two last has only one little surface overspread with cartilage: but the others have two.

2. The *Neck* which is narrow and small, receiving the large head.

3. The *Small Head*, which adheres to the anterior extremity of the neck. Its cartilagi-

comes bony, while their external part is cartilaginous (*Lib.* I. *Cap.* 19.); and Clopton Havers, treating of the cartilages of the thorax, remarks, that they seldom or never become ossified where their greatest motion takes place, that is, in their larger curvature (*Ost. Nov. Dis.* V.).

nous ſurface is convex, and united to the extremities of the tranſverſe proceſſes of the dorſal *vertebrae*. This leſs head is not preſent in the eleventh and twelfth rib.

4. The *Angle of a Rib* is an oblique eminence, unequal, and more or leſs flat, adhering to the poſterior extremity.

The *External Surface of the Ribs* is convex; but the *Internal Surface* is concave: in this latter there is a *Sulcus* towards its inferior margin, which goes forwards from the angle of each rib, and receives moſtly blood-veſſels and nerves.

This *Sulcus* is more remarkable in the inferior true ribs, and the ſuperior ſpurious ones, than in others.

The *Subſtance of the Ribs* is compact externally, and internally ſpongy.

The *Poſterior Connection of the Ribs* is double: for the large head is connected to the articular cavities of the *vertebrae*; and the leſs head to the tranſverſe proceſs of the *vertebra* next below it.

Anteriorly, the ribs are joined to the *ſternum*, by their intermediate cartilaginous epiphyſes. The three ſuperior falſe ribs are connected together by means of cartilages, and alſo to the laſt true rib. The Motion of the Larger Heads is by ginglimus, and of the Leſs Heads by amphiarthroſis.

The *Uſe of the Ribs* is, to form the lateral parts of the *thorax*; to enlarge and to diminiſh the cavity of the *thorax* in reſpiration;

to

to defend the heart and lungs; to be a place of attachment for various mufcles, and a fupport externally to the *mammae* (99).

Of the Pelvis.

The *Pelvis*, which takes its name from its figure (100), is placed at the bottom of the trunk.

It is *divided* into

1. Its *Two Wings* or Superior Lateral Parts, and

2. Its *Hollow*; of which we may notice the *Brim* and *Inferior Aperture* (101).

The

(99) The ribs, at birth, differ little from thofe of adults, in fubftance and form. They are rather more cartilaginous at their pofterior articulation, and have lefs curvature: but their tubercles are bone, and their connection with the *fternum* and *vertebrae* of the back is fimilar to that in adults. Dr. Nefbitt fays, the ribs at the fourth month are fo nearly perfected, as not to differ in appearance from thofe at the ninth (p. 112.).

(100) It is fomewhat like a Barber's bafon that has no bottom. Hence it is wrongly called a *Cavity* in Smellie's Treat. on the Theory and Practice of Midwifery, Vol. I. Sect. III. *Roederer's Elem. Artis Obftet. Cap.* I § 3. and moft other books on this fubject. If it were a cavity, it fhould have a bottom. Meza propofes to call it a *Space (Tract. de Quibufd. Notab. ad Artem Obftet: fpect.).* See Note 109. The figure of the *pelvis* is between that of an ellipfis and a triangle. The direction of the cavity of the *pelvis* is oblique.

(101) Wrifberg commends very highly the divifion of the *Pelvis* into three parts, viz. the *Brim (Introitus)*, the *Cavity (Cavitas*; according to Meza *Spatium*. See Note 100), and the *Inferior Aperture (Exitus)*. He fays this diftinction is abfolutely neceffary in communicating our ideas concerning the fituation of the child's head; whether it be in the *fuperior* or *inferior* aperture of the

The *Pelvis* is composed of the eight bones below-mentioned ([102]), viz.

The *Os Sacrum*, and *Os Coccygis*, posteriorly,
The *Ossa Ilei*, laterally,
The *Ossa Pubis*, anteriorly, and
The *Ossa Ischia*, inferiorly.

I.

The *Os Sacrum* is so named, it seems, because it was antiently sacrificed to the gods. It constitutes the posterior and inferior part of the trunk: it lies confined among the other bones of the *pelvis*, like a wedge, and may accordingly be considered as the base of the whole spine. It is for the same reason, that some anatomists have enumerated the *Os Sacrum*, and *Os Coccygis* with the *vertebrae*, calling them *Spurious Vertebrae*.

This great bone is like an oblong triangle, the base of which is placed upwards, and the apex downwards and inwards. In adults, it

the *pelvis*: that being the most dangerous period of parturition, in which the head of the child ought to pass through the inferior aperture (*Annot. in Elem. Art. Obs. Roedereri*, § 3.).

([102]) Ought not the last *vertebra* of the loins to have been enumerated among the bones of the *Pelvis* (See Note 91)? Its advantage in child-bearing and in labour seems to intitle it to that distinction. It retains the *uterus* in its proper place; obviates its ascension; and directs it to the margin of the *pelvis*.

is a ſingle bone; but in children it may be divided into five or ſix parts: which parts, as before obſerved, are diſtinguiſhed by ſome Anatomiſts under the name of *Falſe* or *Spurious Vertebrae* ([103]).

We may obſerve in the *os ſacrum*,

1. Its *Baſe*, which is raiſed upwards,

2. Its *Apex*, which is directed downwards, receiving the *os coccygis*,

3. Its *Anterior* or *Interior Surface*, which is hollow; and its *Poſterior* or *Exterior Surface*, which is convex,

([103]) Albinus, who has written a whole chapter on this bone (*An. Acad. Lib.* IV. *Cap.* XI.), ſays, that he had an *os ſacrum* which conſiſts of ſix parts, altogether like that conſiſting of only five parts; except in its ſupernumerary part, and the conſequently greater length. He has alſo deſcribed other ſpecimens of the ſame kind. Veſalius, as Albinus remarks, had noticed the ſame thing (*Veſal. de H. C. Fabrica, Lib.* I. *Chap.* 18.): and Albertus relates that he found an *os ſacrum* formed of ſeven parts (*Hiſt. Pler. Part. C. H. p.* 112.): but it is clear the firſt bone of the *os coccygis* was grown to an *os ſacrum*, compoſed of ſix parts; as appears in the figure.

Various Hebrew writers, according to Caſpar Bauhin (*Theat. Anat. Lib.* I. *Cap.* 48.) have dreamt that between the laſt *vertebra* of the loins, and the *os ſacrum*, there is a bone of ſo ſingular a nature as to be deſtructible by no mechanical violence; neither by fire, nor by any other power whatſoever, but that it will remain the ſame to the day of judgment, when the entire man is to be regenerated from it. This bone they called LUS, or LUZ. It was the phantaſm of one Rabbi Uſchagi, who lived *An. Dom.* 210. and wrote a book, the title of which is *Bereſchit Rabba, i. e. Gloſſa Magna in Pentateuchum.* See alſo, concerning this bone, Agrippa *de Philoſ. Occulta. Cap.* 10.

The Moderns make no mention of this bone.

4. Its

4. Its *Two Lateral Margins*, incrusted with cartilage, by the intervention of which it is connected to the *ossa ilii.* Moreover, it has many eminences, *cavities* and *foramina.*

Its *Foramina* and *Cavities* are:

1. The *Ten Foramina*, which run in a double order on the anterior surface of the bone, formed of the united notches of two *vertebrae.* The superior of these *foramina* are large, but as they descend they become less. Through these *foramina* a corresponding number of pairs of sacral nerves pass.

2. The *Ten Foramina* running in a double order on the posterior surface of this bone; they are covered with muscles, and are the passages of small nerves and vessels.

3. The *Foramen* or *Canal* in the middle, like that in the middle of the *vertebrae.* The *Cauda Equina* is contained in this.

The *Lateral Margins* are broad and unequal above. It becomes us to notice the large cartilaginous surface, by the intervention of which the *os sacrum* is joined to the *ossa ilii.*

The *Eminences* of the *os sacrum* are

1. Two *True Oblique Apophyses* superiorly in its base, connected with the last *vertebra* of the loins.

2. *Eminences* posteriorly supplying the place of oblique, transverse, and spinous processes.

3. *Vestiges*, marking the distinct bones in children, on the anterior surface.

The *Substance* of the *os sacrum* is spongy.

 It

It is *connected* ſuperiorly, with the laſt *vertebra* of the loins; inferiorly, with the *os coccygis*; and laterally, with the *oſſa innominata* by means of cartilages and ligaments.

Its *Uſe* conſiſts in being the baſe of the whole trunk; and the poſterior part of the *pelvis*: it receives the *cauda equina*, and has various muſcles annexed to it ([104]).

II.

The *Os Coccygis*, which is ſmall and like an inverted pyramid, adheres to the baſe or inferior part of the *os ſacrum*.

In infants the *os coccygis* conſiſts of three or four parts; but theſe coaleſce into one by age; leaving veſtiges of their original ſeparate condition ([105]).

One

([104]) The *os ſacrum* in man is longer, but ſmaller and leſs curved than in woman. The reaſon of which is evident. It is to enlarge the capacity of the *pelvis*.

([105]) At birth this bone is ſeldom more than four diſtinct cartilages: but Dr. Neſbitt once or twice ſaw a ſmall oſſification at that time in the two ſuperior (Hum. Oſt. p. 107.). Paaw (*De Oſſib. P.* II. *Cap.* 3.) and Spigelius (*De H. C. Fab.*) conſider the flexible ſtate of this bone in children as the cauſe that they are oftener ſubjects of *Prolapſus Ani* than old perſons.

Moſt practitioners in Midwifery aſſign a great part of the inconvenience of child-bearing in women, who do not become mothers till they are old, to the bony connection of the *os coccygis*: for in the natural ſtate, the *os coccygis* is preſſed backwards, and the inferior aperture of the *pelvis* is made larger by the paſſage of the child's head through it. Again, from its elaſticity and preſſure againſt

One may notice in the *os coccygis*,

1. An *Anterior* or *Internal Surface*, which is concave,

2. A *Posterior* or *External Surface*, which is convex,

3. A *Basis*, united to the apex of the *os sacrum*,

4. An *Apex* or *Inferior Extremity*, inflected somewhat forwards, but free.

It is connected with the *os sacrum* by syn-

against the child's head, it prevents the injury which might otherwise be done to the *perinaeum*. Paaw assures us of the inconvenience, which himself had experienced from this bone not receding backwards during delivery (*De Ossib.*). Deventer thought an attention to this of so great moment, that he boasted the peculiar management of this bone amongst his greatest discoveries in midwifery (*Operat Chir. Cap.* 27.).

It is an opinion amongst many, that birth is accelerated and facilitated, by pressing the *os coccygis* backwards with the fingers; but it becomes such assistants of Nature's operations, first, to learn the use of the *os coccygis*, which is to direct the head of the child under the arch of the *pubis*, lest it press against the *perinaeum*; and secondly, to know that if these bones be forced from their proper place, they may easily become immoveable.

Notwithstanding the consequences of a dislocation of the *os coccygis*, (which are inflammation and abscess,) a disease which is to be cured by introducing the finger into the *rectum*, it is certain, from the examination of living subjects, and those recently dead, that the *os coccygis* may easily be pressed backwards, at least an inch, in women that have borne children.

Beside the ordinary action of the *coccygei* muscles, as Roederer justly observes (*Elem. Art. Obstet.* § § 30. 7.) suggests a reason, that the *os coccygis* should be moveable.

The *os coccygis* in women does not project so far forwards as in men (See Note 104.) on the *os sacrum*.).

 chondrosis,

chondrofis, arthrodia, and diarthrofis: and to the *Offa Ifchii* by fyndefmofis.

It conftitutes a part of the *pelvis*, and fupports the *inteftinum rectum*, which lies upon it.

III.

The *Offa Ilii* form the fuperior and lateral parts of the *pelvis*.

Their *Figure* is irregular.

We may obferve in each bone,

The *Internal Surface*, which is concave, and covered with mufcles, like the external: it is unequal pofteriorly, and in part covered with the cartilage which is united to the lateral part of the *os facrum*.

The *External Surface*, which is unequally convex anteriorly, and fomewhat excavated.

The *Superior Margin*, or *Crifta Ilei*, which arifes from the *Pofterior Iliac Spine*, and runs as far as the *Superior* and *Anterior Iliac Spine*. This margin, in the recent bone, is like an arch covered with cartilage, and divided into an external and an internal *labium*. The extremities of this *crifta* are called the *Spinous Proceffes* of the *Os Ilei*.

The *Lowermoft Part* or *Bafe* of the *Os Ilei* conftitutes a great part of the *Acetabulum* (106*), which is deftined for the reception of the *os femoris*,

(106*) Monro fays, that this bone reaches about as far downwards as a tranfverfe fection of one third of the *acetabulum*.

femoris, and the formation of the greateſt part of the *Iſchiatic Notch.*

The *Eminences of the os ilei* are

1. The *Poſterior Iliac Spine*, which is ſituated poſteriorly at the beginning of the ſuperior margin, where the *os ilei* is joined to the *os ſacrum.*

2. The *Anterior* and *Superior Iliac Spine*, which is ſituated anteriorly at the end of the ſuperior margin of the *os ilei.*

3. The *Inferior* and *Anterior Iliac Spine*, which is immediately under the former.

4. The *Oblique Iliac Spine*, which ſeparates the *os ilei* from the *os pubis.*

5. The *Tranſverſe Line*, which runs tranſverſely backwards, from the oblique ſpine to the *os ſacrum*; ſeparating the internal ſurface of the *os ilei* from the *os iſchii* and *os pubis.*

The *Cavities* and *Foramina* are

1. The *External Iliac Cavity*, and

2. The *Internal Iliac Cavity*, the former being in the external ſurface of this bone, the latter in the internal ſurface.

3. The *Notch* between the anterior iliac ſpines.

The *Fabric* of theſe bones is compoſed of two thin bony *laminae*, between which there is a ſpongy ſubſtance. The poſterior and inferior part of theſe bones is the thickeſt, and the middle part is the thinneſt and moſt compact.

In Infants, the *criſta* of the *os ilei* is cartilaginous, and is joined to the bone under

the form of an epiphyſis. The great inferior extremity is not perfectly bony in infants.

The *Os Ilei* is connected with the *os ſacrum* by ſynchondroſis, and with the *os ichii* and *os pubis* by ſynoſtoſis (106).

IV.

The *Oſſa Iſchii*, *Oſſa Coxae* or *Coxendicis*, conſtitute the lowermoſt lateral parts of the *pelvis*.

Their *Figure* is irregular.

One may obſerve in theſe bones,

1. The *Body*, which forms the lowermoſt and greateſt part of the *acetabulum*.

2. The *Tuberoſity* of the *os iſchii*, which is that part of its inferior margin upon which we reſt in ſitting (107). It has various depreſſions for the inſertion of muſcles.

3. The *Spine*, in the poſterior and ſuperior part of this bone.

4. The *Small Crus*, connected with the *os pubis*, and concurring to form the *foramen ovale*.

(106) This bone is thicker in proportion to its magnitude at birth; and it is more ſpongy than in adults. See Note 107).

(107) As theſe tubercles ſuſtain the weight of our body when we ſit, it follows that in women who are generally addicted to a ſedentary life, they ſhould be both larger and flatter than in men. The truth of this is proved by obſervation.

5. The *Foramen Ovale*, which is a large aperture formed by the union of the *os iſchii* and *os pubis*. In its ſuperior margin, it has an oblique notch, for the paſſage of the ſhort iſchiatic nerve and blood-veſſels. The two *Obturatores* Muſcles completely cover this aperture ([108]).

6. The *Three Notches*; of which the *Poſterior* is between the ſpine and protuberance of the *os iſchii*, for the paſſage of the *obturatores interni* muſcles; the *Lateral* is between the protuberance and the *acetabulum*, ſerving for the paſſage of the *obturatores externi* muſcles; and the *Anterior* is at the margin of the *acetabulum*, ſerving for ligaments.

The *Oſſa Iſchii* are joined by ſuture to the *oſſa ilei* and *pubis*.

Theſe bones do not differ in ſubſtance from other flat bones. Their ſuperior and poſterior part is broad and thick; their inferior and anterior part is more narrow and thin.

In children, immediately after birth, that part of theſe bones which helps to form the

([108]) The uſe of this *foramen* ſeems to conſiſt in its diminiſhing the quantity of bony matter, and leſſening the weight, which the *pelvis* muſt otherwiſe neceſſarily have. There is a diſeaſe of this part, firſt deſcribed by Garengeot (*Tome Premier 4to. de ceux de l'Acad. de Chirurgie, à Paris*) called the *Hernia of the Foramen Ovale*; in which, a portion of the *omentum* and inteſtinal canal is protruded from the cavity of the abdomen. This *Hernia* is ſituated in the ſuperior and internal part of the thigh, near the *ſcrotum* of man, and the *labia pudendi* of woman.

acetabulum, and the ſpine, and the protuberance, are cartilaginous.

V.

The *Oſſa Pubis* conſtitute the anterior part of the *pelvis.*

Their *Figure* is irregular.

We may obſerve in them,

1. The *Thicker* and *Largeſt part*, which concurs to form the *acetabulum* ; in the anterior extremity of which, there is a ſmall eminence called the *Spine* of the *os pubis.*

2. The *Small Crus* turned downwards, and joined to a ſimilar one of the *os iſchii*, concurring to form the *foramen ovale.*

3. The *Superior Margin*, and

4. The *Inferior Margin*, in which there is a notch forming a part of the *foramen ovale.*

5. The *Internal* or *Anterior Part*, which is united with the *os pubis* of the other ſide.

The *Oſſa Pubis* are conjoined together by ſynchondro-ſymphiſis, and to the *oſſa ilei* and *iſchii* by ſuture (109).

These

(109) The cartilage which connects the *oſſa pubis* together is always thicker than that connecting the *os ſacrum* with the *oſſa ilium.* In both places, it becomes thicker in child bearing women, which oftentimes renders the connection ſo looſe and unſtable, as to give origin to pain, and crackling in walking. The cauſe of the enlargement of the cartilage at this time, ſeems to be the greater afflux of fluids. As to the ſeparation of the *oſſa ilei* from the *os ſacrum*, and the *oſſa pubis* from each

Theſe three laſt bones, placed on each ſide, that is, the *os ilei, os iſchii,* and *os pubis,* are com-

each other during parturition, which was noticed not only by Hippocrates, Avicenna, and other antient phyſicians; but alſo by Riolan (*Anthropogr. Lib.* VI. *Cap.* XII.), Diemerbroeck (*Lib.* XI. *Cap.* XVI.), Hunter (*Med. Obſ.* and *Inq. Vol.* II. *p.* 331.), and other late anatomiſts: there can ſcarcely be a doubt of its happening. Nevertheleſs, if we confide in Morgagni (*Adverſ. Anat.* II. *Animad.* XV.), this ſeparation is not common. And, if it ever do take place, it will be hard to aſſign the cauſe.

That a ſeparation of the bones of the *pelvis* may happen in robuſt and healthy people, from an external cauſe, is evident from the hiſtory of a peaſant communicated to the Royal Academy of Surgery at Paris, by Monſ. Philippe (*Mem. de l'Acad. Royale de Chir. Tome premier* 4to.).—This peaſant in carrying a ſack of corn, and ſuffering another to raiſe it from his ſhoulders, by ſome miſhap, the ſack fell upon his loins. As he ſeemed little injured by the accident, he followed his buſineſs, and felt little or no pain during the firſt two days. But on the third and fourth day, the pain was conſiderable, and he was bled ſeveral times, but died thirty days after the misfortune. When his body was diſſected, the *os ſacrum* was found ſeparated from the *os ilium* three inches. Monſ. Enaux likewiſe ſaw an inſtance of the *os innominatum* being luxated in conſequence of a fall, in which ſurgery could not replace the bone. Nature cured the patient, though he remained ſomewhat lame (*Nov. Mem. de l'Acad. de Dijon.* 1784.). It has already been ſaid, in what each bone of the *pelvis* of man and woman differs; it remains now, that the *pelvis* itſelf be ſpoken of, its difference from that of man, and the cauſe of the difference.

Statuaries had long ſince taken notice of the relative proportion of the diſtance between the trochanters of the *oſſa femorum,* and the condyles of the *oſſa brachialia,* in both ſexes: they obſerve that, in woman, the diſtance between the former is greater than between the latter; but

comprehended by moſt Anatomiſts under the name of *Oſſa Innominata*; and hence they divide

but that, in man, the contrary is true. All men agree that the beauty of the female frame conſiſts in the larger ſize of the *pelvis*, and the uniform rotundity of the *nates*.

Wriſberg, however, advances further, and ſays, or ſeems to ſay, that if a woman have a ſmall *pelvis*, like that of a man, and a flattened breaſt, ſuch women having difficult labours, as theſe peculiarities detract from the wonted, native elegance of her ſhape, ſo likewiſe they are preſumptive proofs that ſhe is a virago (*Annot. in* § 12. *El. Art. Obſt. Roed.*).

As the upper parts of the thighs are placed ſo far apart in women, this may be the cauſe that in preſerving the center of gravity, they ſhuffle when they walk. The *Pelvis*, if well formed, is generally allowed to have a circumference equal to one fourth of the height of the female.

The diameter of the ſuperior aperture of the female *pelvis*, if meaſured tranſverſely from the middle part of one *os ilium* to the other, is commonly five inches and a quarter; if meaſured from the tubercle of the *os ſacrum* to the *ſymphyſis pubis*, it is only four inches and a quarter; and, if it be meaſured obliquely on each ſide, from the poſterior angle of the *os ſacrum* to the oppoſite part of the *oſſa pubis*, which is the largeſt diameter, it is five inches and a half. But this laſt, *oblique diameter* as it is called, is often leſs than the firſt, or *tranſverſe diameter*, which nevertheleſs is of little conſequence, provided the ſecond or *conjugate diameter* be of proper dimenſion. The tranſverſe diameter of the inferior aperture of the *pelvis*, taken from the tuberoſity of one *os ilium* to that of the other, is equal to the conjugate diameter of the ſuperior aperture. The Inferior conjugate diameter, which is meaſured from the apex of the *os ſacrum* to the under part of the arch of the *pubis*, is equal to the tranſverſe diameter of the ſuperior aperture. We meaſure the conjugate diameter from the apex of the *os ſacrum*, becauſe it would be indeterminate

divide the *pelvis* into the *os ſacrum, os coccygis*, and two *oſſa innominata*.

It is to be obſerved particularly of theſe bones, *that* they are joined together by ſynoſtoſis to form the *acetabulum*, which is intended to receive the *os femoris*; therefore, that they are connected to the head of the *os femoris*, through the intervention of the *acetabulum* by enarthroſis.

This *Acetabulum* is placed inferiorly on the external ſurface, where theſe three bones coaleſce. It is turned obliquely outwards. We may notice its *Margin* and *Notch*, the *Articular Cavity*, and the *Excavation* in the bottom of the cavity.

The *Margin* is very prominent, though it does not form an entire circumference around

determinate if meaſured from the *os coccygis*, which is moveable.

Now the direction of the ſuperior aperture of the *pelvis* makes an angle of 55° with a horizontal line; and that of the inferior aperture, when the female is erect, inclines from a horizontal line at an angle of 18°.

The ſuperior axis of the *pelvis*, which is a perpendicular line in the direction of the ſuperior aperture, does not accord with the axis of the trunk, but forms an angle with it of 35°. The inferior axis inclines from the horizon at an angle of 72°.

The depth of the *pelvis* is, for the moſt part, anteriorly two inches, poſteriorly five or ſix, and laterally four; which ſhould particularly be remembered, as it is of great importance in the application of the forceps of Smellie, Levret, and others.

What relates to ill-formed *pelves*, as it is fully treated of in books on Midwifery, it may be wholly omitted in this.

the

the *acetabulum*; but is gradually depreſſed anteriorly and inferiorly, and is at length altogether interrupted by a *Notch*, through which veſſels paſs to the *acetabulum*. In the recent bones, this defect in the margin is ſupplied by a flexible, ſtrong ligament. The cavity itſelf is inveſted with a very ſmooth cartilage, which in the recent bones is ſomewhat higher than the margin, making the cavity deeper. The cartilage now mentioned does not cover the whole *acetabulum*, but its anterior part only. Laſtly comes the *Excavation*, which is unequal, is lined with cartilage, and receives the articular gland and round ligament.

The *Uſe* of all theſe bones is to form the *Pelvis*, and the *acetabulum* for the reception of the *os femoris*.

The *Uſe of the Pelvis* is to contain and ſecure a part of the *inteſtinum ileum*, the *inteſtinum rectum*, the urinary bladder, the *veſiculae ſeminales* and ſpermatic ducts in men, and the *vagina*, and adjoining parts in women.

Of the Bones of the Upper Extremities.

The *Arms*, or *Upper Extremities*, as was already obſerved, hang from both ſides of the *thorax*, to which they are affixed, and extend even below the *pelvis*. Each of them is divided into four parts: viz.

1. The *Shoulder*,

2. The

2. The *Arm*,

3. The *Fore-arm*, and

4. The *Hand*: all which parts, collectively confidered, confift of thirty-two bones, which we fhall now feverally defcribe. That which relates to the bones of one arm, relates equally to thofe of the other.

The Upper Extremities were given to us to perform our labour, and to defend our bodies.

Of the Bones of the Shoulder.

The *Shoulder*, which is the firft part of the arm, is compofed of two bones: viz. the *Scapula* and *Clavicula*. The *Top of the Shoulder* is the place where thefe two bones are connected.

Of the Scapula.

The *Shoulder Bone* or *Os Omoplatae*, is placed fuperiorly and pofteriorly in the back. It extends from the firft to about the feventh rib.

Its *Figure* is almoft triangular. It is a broad, fmooth, and thin bone. It is bone even in foetus of five months old (110).

We

(110) The *Scapula*, at birth, has the bony rim of its *bafis* more round than in adults. It is alfo furrounded by a large cartilage at its inferior angle, which is rounder than in adults. The furface of the *fcapula* next to the ribs is not fo hollow, but it is much fmoother. Its fpine is

We may obſerve in the *ſcapula,*

1. Its *Anterior* and *Poſterior Surface,*

2. Its *Superior, Anterior,* and *Poſterior Margin,*

3. Its *Three Angles*; the *ſuperior,* which is external, the *inferior,* and the *Anterior* or *Superior Internal.*

4. Some *Eminences,* and

5. *Cavities.*

The *Poſterior* or *External Surface* is raiſed unequally, and divided into two, by the *Spine of the Scapula.* The ſuperior part is narrow, but the inferior is much broader; both parts are covered by muſcles.

The *Anterior* or *Internal Surface* is unequally concave, and marked by many eminent lines, to which the incumbent muſcle is attached.

The *Superior Margin* is the ſmalleſt and thinneſt. It is ſituated between the neck of the *ſcapula* and the ſuperior external angle.

The *Poſterior* or *External Margin* is called by ſome the *Baſe of the Scapula*; it is the longeſt of all; it deſcends obliquely near the ſpine, ſo that it is at a greater diſtance from the *vertebrae* of the back inferiorly. It has an *Internal* and an *External Labium.*

is not ſo high. Its extremity which is connected with the *acromion* is neither ſo much curved nor ſo round.

The Coracoid Proceſs is wholly cartilaginous.

The Glenoid Cavity, into which the head of the *humerus* is received, is more ſhallow, and narrower at its upper part (Neſbitt's Oſteog.).

The

The *Anterior* or *Internal Margin* is the thickeſt. It deſcends obliquely backwards from the neck to the inferior angle. It is manifeſtly divided by a *furrow* into two *labia*, the *external* of which is thin, but the *internal* is thick and round.

The *Three Angles* of the *Scapula* are ſo placed, that the *ſuperior*, which is called the *External*, is between the poſterior and ſuperior margin. The *other* is ſituated between the poſterior and anterior margin, and is called the *Inferior Angle*. Finally, the *Anterior* or *Superior Internal Angle* is that which lies between the Superior and Inferior margin. It is the largeſt, and is called the *Neck of the Scapula*.

The *Eminences* of the *Scapula* are theſe: viz.

1. The *Spine of the Scapula*, which divides the poſterior ſurface.

2. The *Coracoid Proceſs*, or Proceſs like the beak of a crow, as it is called from its figure: it ariſes from the anterior part of the ſuperior margin, aſcends from thence, and is inclined forwards, where it ends in an obtuſe point. It is a place of attachment for various muſcles.

3. The *Acromion* is a broad production of the ſpine of the *ſcapula*, flattened anteriorly for its connection with the clavicle, and covered with a cartilaginous ſurface.

Its Cavities are,

1. The *Glenoid* Cavity, which is ſituated at the extremity of the neck of the *ſcapula*,

is of a form almoſt oval, broad below, narrow above, and covered with cartilage. It receives the head of the *os brachiale.*

2. The *Small Depreſſion* at the end of the *acromion*, in which the clavicle is faſtened.

3. The *Supra-ſpinal*, and

4. The *Infra-ſpinal Cavity* in the poſterior ſurface of the *ſcapula.*

5. The *Three Notches* in the ſuperior part of the *ſcapula*, which from their various ſize, are diſtinguiſhed into the *Small Notch*, ſituated between the ſuperior margin and the coracoid proceſs; the *Large Notch*, formed of the ſpine and neck of the *ſcapula*; and the *Middle Notch*, formed of the coracoid proceſs and the glenoid cavity.

The *Subſtance* of the *ſcapula* is ſpongy, being covered externally by compact *lamellae.* Neverthelefs, the ſpongy ſubſtance is of various thickneſs, for in the neck and coracoid proceſs it is very thick, in the inferior margin and ſpine it is leſs thick, and it is thinneſt in the body, which is conſequently almoſt wholly tranſparent.

The *Connection* of this bone is, 1. with the *os brachiale* by arthrodia: 2. with the clavicle by ſynarthroſis: 3. with the head, the *Os Hyoides*, the *Sternum*, the Ribs, and the *Vertebrae* by ſyſſarcoſis.

Its *Uſe* is, to be joined to the *os brachiale*, to defend the poſterior part of the trunk, to render the motion of the various muſcles inſerted

inſerted into it more eaſy, and, laſtly, to aſſiſt eſpecially in carrying burthens.

Of the Clavicle.

The *Clavicle* is placed almoſt horizontally in the anterior part of the thorax, between the *acromion* and ſuperior and lateral part of the *ſternum.*

Its *Figure* is ſomewhat like the italic letter *ſ.*

It is perfected in foetus, and properly incurvated (111).

It is divided, as all cylindrical bones are, into its *Body*, and its *Anterior* and *Poſterior Extremity.*

The *Body*, together with the anterior extremity, forms an arch; hence this bone is convex externally, and concave internally. The body has two *Surfaces*, the *Superior* of which is the ſmoother, for the *Inferior* is marked with a *Superficial Furrow*, in which the ſubclavian veſſels lie.

The *Anterior Extremity* is thicker han the poſterior; it is almoſt triangular, and is united laterally to the uppermoſt cavity of the *ſternum.*

The *Poſterior Extremity* is ſmaller, flatter, and ſmoother than the preceding: it is unequal both above and below, from various

(111) This bone is ſo completely formed before three months after conception as to differ from that of adults only in magnitude.

eminences, and is inflected outwards fo as to make a fmall arch. It has a fmooth, roundifh articular furface, covered with cartilage, and united to the *acromion*.

Its *Subftance* is fpongy, it is covered with compact *lamellae*.

It is connected by its anterior extremity with the *fternum*, and by its pofterior extremity, fuperiorly and pofteriorly, with the *acromion* by arthrodia ([112]).

Its *Ufe* is to render the fuperior extremities firm, left they roll too far forwards over the *thorax*; to defend fome of the larger veffels, and to unite the *fcapula* and fhoulder to the *thorax* ([113]).

Of the Os Brachiale ([114]).

The *Os Brachiale*, or *Os Humeri*, takes its name from its fituation: it begins between the *acromion* and fore-arm at the breaft, and is pendulous by its fides.

Its *Figure* is cylindrical.

It is *divided*, like other cylindrical bones, into *two extremities*, both which are epiphyfes

([112]) Monro fays, that "fometimes a moveable ligamentous cartilage is found in this joint; otherwhiles fuch a cartilage is only interpofed at the anterior half of it, and in fome old people I have found a fefameid bone here." Ofteol. p. 244.

([113]) This bone is lefs incurvated in women than in men (Kuhn *Tab. Anat. p.* 60. 6.).

([114]) Celfus obferves—"*Brachium conftare ex cubiti offe et radii* (*Lib.* VIII. *Cap.* I.)." It may be ufeful to remember this in perufing the books of old Anatomifts.

in children, and into the *middle part* or *body* (115).

In its *Superior Extremity* we may take notice of the following *eminences* and *cavities*: viz.

1. The *Head*, which is hemifpherical, and covered with cartilage, its center being turned obliquely backwards, towards the articular cavity of the *fcapula*, into which it is received.

2. The *Neck*, which is fmall and placed below the head.

3. The *Larger Tubercle*, pointing upwards, and feated oppofite the head; it has two fmall furfaces, to which mufcles are attached.

4. The *Smaller Tubercle*, which is feated more laterally, having alfo a fmall furface for the adhefion of mufcles. Betwixt both thefe protuberances, there is a *Furrow* of confiderable depth, which paffes backwards and receives the long tendon of the *Biceps* Mufcle.

At the *Inferior Extremity*, there are three *Articular Condyles*:

The *External Condyle* is unequally oblong, and very fmall. It is directly under the great protuberance of the fuperior extremity.

(115) The *Os Brachiale* is ftraiter in fœtus than in adults. There is, at this time, no cavity for the reception of the coronoid epiphyfis of the *ulna* in the flexion of the fore-arm, nor is there the fmall cavity for the head of the *radius* (Nefbitt's Ofteog.).

The *Internal Condyle* is larger than the former and very protuberant.

Various mufcles are affixed to thefe two condyles.

Between the internal and external condyle, there is the *Capitated Condyle*, which is covered with cartilage, and received by the fuperior extremity of the *radius*.

Between this and the external condyle, there is the *trochlea* or pulley of the *os humeri*, in the middle, in which the *os ulnae* is in-ferted.

Befides, there are three fmall *Depreffions*, two of which are *Anterior* and one is *Pof-terior*.

The *Great Depreffion* is placed imme-diately over the internal *foveola* of the *trochlea*, receiving the coronary procefs of the cubit.

The *Small Depreffion* is placed externally over the capitated condyle.

The *Pofterior Depreffion*, which is the largeft, is placed immediately behind the broader *foveola* of the *trochlea*, that the *oleo-ranon* may enter it in extending the arm.

The *Body* is thick above, and round-ed; inferiorly, it is fmooth and fmall. There are three *Prominent Lines* in it; the *firft* of which paffes from the large tubercle, the *fecond* from the fmall tubercle to the inferior extremity, and the *third* extends as far as the external condyle of the inferior

ex-

extremity This bone is divided by these lines into so many *surfaces*.

The *Substance* of its body is compact, internally reticular, and filled with marrow. The substance of each extremity is spongy.

It is connected superiorly with the *scapula* by diarthrosis, with the *radius* by lateral and angular ginglimus, and with the *ulna* by angular ginglimus.

The *Use* of this bone is to concur to form the arm.

Of the Bones of the Fore Arm.

The *Fore Arm*, as already noticed, consists of two bones; the one placed internally towards the little-finger, called the *Ulna*, the other externally towards the thumb, called the *Radius*.

Of the Cubit.

The *Ulna* or *Cubit* is placed on the inside of the fore arm, from the *trochlea* of the *os humeri* towards the little finger. It is longer than the *Radius*.

The *Figure* of the *ulna* is unequal and triangular; it is thicker above, and becomes gradually smaller downwards.

It is divided into its *Body*, and its *Superior* and *Inferior Extremity*.

In its superior extremity, it has *two Processes*, the *Larger* of which is called *Olecranon* or *Processus Anconeus*. The *Smaller*, which is

more acute and more anterior, is called the *Coronary Procefs* ; under this latter procefs there is a fmall *Eminence* to which the tendon of the *brachialis internus* mufcle is attached.

Its *Cavities* are

1. The *Great Sigmoid Cavity* placed between the proceffes above mentioned, which is lined with cartilage, and divided into two by a *prominent line*, extending through the middle, from the coronary procefs to the tubercle. Both thefe parts are again conjoined by a *tranfverfe furrow*. It is wholly deftined for the infertion of the pulley of the *humerus*.

2. The *Small Sigmoid Cavity* placed on the outfide of the coronary procefs, and covered with cartilage, like the former, for the rotation of the lateral part of the fuperior extremity of the *radius*.

The *Inferior Extremity* is more narrow, and lefs than the fuperior: we may notice in it,

1. The *Small Head*, which is fomewhat hollowed anteriorly, and covered with cartilage on all fides.

2. The *Styloid Procefs* placed laterally towards the tubercle, and feparated from the Small Head by a notch. This procefs, together with the fmall head, conftitutes a kind of Ancle on the inferior and internal part of the fore arm.

The part below the fmall head, which is more narrow, is called the *Neck*.

The

The *Body* is diviſible into three *Surfaces*, and as many *Angles*; the *firſt* of which is concave, and placed by the ſide of the ſmaller ſigmoid cavity; the *ſecond* is round and narrow, and ſituated under the tubercle; the *laſt* is flattened, and ſeated on the oppoſite ſide.

The *Exterior Angle* is ſharp, deſcending from the ſmaller ſigmoid cavity: the interoſſeal ligament adheres to this angle. The two *Internal Angles* are diſtinguiſhed into the *Superior* and *Inferior*, both ariſing from the tubercle.

The *Subſtance* of the cubit, as of the *os humeri* and all cylindrical bones, is threefold.

Its *Connection* above is made by angular ginglimus with the *trochlea* of the *humerus*, below with the wriſt by arthrodia; and laterally, both above and below, with the *radius* by angular ginglimus.

Its *Uſe* is to concur in forming the fore arm, and in facilitating the flection and extenſion, and the rotation both inwards and outwards [116].

Of the Radius.

The *Radius* lies on the outſide of the fore arm, towards the thumb.

[116] At birth, it is curved more inwards than afterwards. Its body is no where triangular, as in adults. The *Olecranon* is cartilaginous, and ſo is the inferior head of the *ulna*.

Its

Its *Figure* is cylindrical, unequal and triangular.

The *Subſtance* and the *Diviſion* of this bone is the ſame as that of the *Ulna*, except that the *radius* is ſomewhat ſhorter.

The *Little Head* or *Superior Extremity* of the *radius* is ſmaller than the inferior. It is excavated, and covered with cartilage, for the inſertion of the capitated condyle of the *os humeri.* The margin next the *ulna* has a broader cartilage to be united to the ſigmoid cavity of the *ulna.* Under the little head there is the *Neck*, which ends poſteriorly in an uneven *Eminence*, to which the tendons of the *biceps* muſcle adhere.

The *Inferior Extremity* of the *radius* is broad, and poſſeſſed of three *Surfaces* and as many *Angles*.

Two of the *Surfaces* are broad, the other is narrow. The one of the broad ſurfaces is ſituated under the flexion of the *humerus* backwards, it is ſmooth, but ſomewhat hollowed; the other broad ſurface is broader than the former, is placed under it, and inclined downwards. This latter ſurface is unequally convex, and divided by certain prominent *lines* into three or four *longitudinal furrows*, in which the tendons of muſcles are inſerted. The Narrow Surface is hollowed longitudinally, by means of its ſigmoid notch covered with cartilage, it receives the inferior extremity of the *ulna.* *Two* of its Angles ſurround its narrow ſurface, ſo that they ſeparate

parate all the three ſurfaces from one another. The *Third Angle* is ſituated betwixt both broad ſurfaces, and is inclined outwards in the poſition of the arm already mentioned; it terminates in an obtuſe point, which is called the *Styloid Proceſs of the Radius.* The Angle now mentioned and the obtuſe point, both together, conſtitute a kind of Ancle externally. The whole inferior extremity of the *radius* ends in a ſuperficial oblong, triangular *Excavation*, which is covered with cartilage, and divided by a very ſmall line, into two parts, which receive the two firſt bones of the *carpus*.

The *Body* of the *Radius*, which is turned ſomewhat outwards, has three *Surfaces*; *one* external, which is *round*, and *two* internal, which are *flat*. It has alſo three *Angles*, the *ſuperior* and *inferior*, which are obtuſe, ſeparating the round ſurface from the two flat; the third angle, which is the *internal*, is acute, ſeparating the ſurfaces already noticed from one another, and keeping the interoſſeal ligament firm. In theſe ſurfaces, there are various inequalities to which muſcles are attached.

The *Radius* is connected above with the capitated head of the *os humeri* by angular and lateral ginglimus; below with the *oſſa naviculare*, *ſemilunare*, and *cuneiforme* of the *carpus*, by arthrodia; and above and laterally with the *ulna* by lateral ginglimus.

Its

Its *Uſe* is to concur in forming the fore arm, and aſſiſting the flection of the hand inwards and outwards ([117]).

Of the Bones of the Hand.

The Bones of the *carpus*, *metacarpus*, and fingers compoſe the Hand.

Of the Carpus.

The *Carpus* is ſituated between the fore arm and *metacarpus*; it conſiſts of eight ſmall bones, the figure of which is irregular. Theſe bones are divided into two claſſes.

The *Figure* of the *carpus* is quadrangular.

We ſhould notice of the *carpus*, its two *Surfaces*, the *external*, which is convex, conſtituting the *back of the hand*; and the *internal*, which is concave, and poſſeſſed of four eminences, to which the internal tranſverſe ligament of the wriſt adheres:

Its *Four Margins*; the *Superior*, which is convex; the *Inferior*, which is connected with the *metacarpus*; the *External*, which is large, and turned towards the *radius* or thumb; and the *Internal*, which is ſmall, and turned towards the *ulna* or little finger.

Each of the two claſſes is made up of four bones, of which thoſe that are placed above

([117]) Both extremities of the *radius* are epiphyſes at birth; but about four months after conception, this bone and the *ulna* do not differ in any thing very remarkable from thoſe at nine months.

are joined to the bones of the fore arm, but thoſe that are below, are joined to the bones of the *metacarpus.*

In the *Firſt Claſs,* from the *radius* towards the *ulna,* are comprehended the

1. *Os Naviculare* [118],

2. *Os*

[118] There are two methods of diſtinguiſhing the bones of the *carpus*; the one is by giving to each a peculiar name, the other is by giving to each a numerical denomination. Michael Lyſerus, the *Anatomicus Adſiſtens* of Bartholine's ſchool, is ſaid to have invented the former, and the greater number of Anatomiſts ſtill retain and prefer his method. Heiſter, however, choſe to diſtinguiſh them by numbers, thinking the impoſition of peculiar names altogether needleſs (*Comp. Anat. Ed. Amſtel.* 1748.). But Monro rightly ſays, that—"the method of ranging them by numbers leaves Anatomiſts too much at liberty to debate very idly, which ought to be preferred to the firſt number, &c." (Oſteol. p. 260.).

As Lyſerus is upon my table, the book being hard to be gotten by many, I will endeavour to oblige my curious reader by tranſcribing his words.—"*Impoſſibile enim eſt oratione eum (poſitum) manifeſtare, cum propriis nominibus oſſa iſta careant. Tentabo tamen an aliquali deſcriptione, quo ordine conjungenda ſint, indicare poſſim, impoſitis nominibus a forma eorum depromptis. Pollici ſubjacet cubiformi ſimile, ſed valde inaequalibus lateribus; trapezoides rectius diceres: Indici trapezium: Medius pro fundamento habet os omnium in carpo maximum et craſſiſſimum, in poſtica parte capitulum obtinens: Annulari et minimo ſubſtat os unciforme, quia interius in manu unci in modum eſt incurvatum, huic adjacet in latere externo aliud oſſiculum, cujus latera quatuor triangula conficiunt, cuneiforme dici poteſt; cui iterum adhaeret minus adhuc oſſiculum piſi ſativi magnitudine, parte ea, quae priori objicitur, depreſſum. Sex illa oſſa ordine recenſito* connectenda. Ideoque ſingula bis acu pertundes, ac filum [illegible] per ſumma *metacarpi capita traduces: non tamen* [illegible] *conjunguntur,*

2. *Os Semilunare*,
3. *Os Cuneiforme*, and
4. *Os Piſiforme*, or *Orbiculare*.

Theſe bones now mentioned have, all of them, their proper articular *Surfaces*, which are covered by cartilage and connected with the contiguous bones.

The following belong to the ſecond claſs: viz.

1. *Os Multangulum Majus*,
2. *Os Multangulum Minus*,
3. *Os Capitatum*, and
4. *Os Unciforme*.

The *Os Naviculare* has four *Surfaces*; the *Superior*, which is convex, and joined to the inferior extremity of the *radius*; and the *Inferior*, which is covered with a thick, but a ſmall cartilage, the former of which is connected with the firſt bone of the ſecond order, the latter with the ſecond bone of the ſame order. The *Internal Surface* has two cavities, the great one, which receives the *os capitatum*, and the ſmall one, which receives the *os ſemilunare*. It is this very bone which

guntur, ſed oblique nonnihil et arcuatim. Bina adhuc ſuperſunt oſſa, quorum alterum κατυλοειδὲς *appello, ob ſinum, quo capitulum maximi oſſis recipit: alterum lunatum nomino, quia ſinum nactum eſt ſemilunarem, quo eidem capitulo occurrit (Culter Anatom. Lib.* V. *Cap.* II.)."

Kerckringius ſays the cartilages which ſupply the place of the carpal bones, are often united together; but Neſbitt aſſerts that they are always generated diſtinct, and have the ſame articulations as at birth, when though totally cartilaginous, they are nevertheleſs of the ſame form as thoſe of adults.

forms

forms one of the four protuberances of the *carpus*. The *External Surface* is unconnected.

The *Os Semilunare*, which is another bone of the firſt order, has alſo its four *Articular Surfaces*: viz.

The *Superior Surface*, which is round and convex, forming with the convex ſurface of the *os naviculare*, a ſmall long protuberance, received by the inferior depreſſion of the *radius*.

The *Inferior Surface* is concave, and with a ſimilar ſurface of the *os naviculare*, receives the *os capitatum*.

The *Internal Surface* is nearly triangular to receive the *os cuneiforme*; and the *External* to receive the *os naviculare*.

The *Os Cuneiforme* is the third bone of the firſt order, having the four following *Articular Surfaces*. The *Firſt* which is protuberant, makes the ſuperior margin of the *carpus*, the *Second* is united with the *os unciforme*, the *Third* with the *os ſemilunare*, and the *Fourth* with the *os piſiforme*.

The *Os Piſiforme* is the fourth bone of the firſt ſeries. It conſtitutes the ſecond protuberance of the *carpus*. It has only one ſurface, which is cartilaginous, and conjoined to the *os cuneiforme*.

The other order of bones belonging to the wriſt begins from the *os multangulum majus*, which forms the third protuberance of the *carpus*; and has a *ſulcus* anteriorly, in which the tendon of the *flexor pollicis proprior* muſculus is inſerted.

This

This bone has four *Articular Surfaces*: viz. the *Superior*, which is concave, and connected with the *os naviculare*; the *Inferior*, which receives the firft bone of the *metacarpus*; the *Internal*, which is turned upwards, to the fecond bone of the firft order, and is connected inferiorly with the extremity of the fecond bone of the *metacarpus*. The External Surface of the *os multangulum majus* is free from attachment.

Os Multangulum minus is another bone of the fecond order of the *carpus*, in which we may notice the following cartilaginous *Surfaces*: viz. the *Superior*, that is fmall, and connected with the *os naviculare*: the *Inferior*, that is joined to the inferior extremity of the fecond metacarpal bone: the *External*, that is attached to the firft bone of the fecond order of the *carpus*: and the *Internal*, that receives the third carpal bone of the fecond order.

Os Capitatum is the third bone of the fecond order of the *carpus*. It has a fmall, round *Head* fuperiorly, which is covered with cartilage, and enters the cavity formed by the two firft carpal bones of the firft order. It has a furface inferiorly, that is unequally triangular, connected with the third bone of the *metacarpus*. Its *External Surface*, which is the leaft of all, is united to the *os multangulum minus*; and its *Internal Surface* is attached to the furface of the *os unciforme*.

Os Unciforme is the fourth bone of the fecond order of the *carpus*.

Its

Its parts worthy of notice are, the *Head*, the *Proceſs*, and the *Three Surfaces.* The *Proceſs*, which is flat and curved, extends from the internal part of the body, and forms the fourth protuberance in the concavity of the *metacarpus.* The *Internal Surface* is united to the ſurface of the *os capitatum.* The *Superior Surface* is partly convex and partly concave, to be adapted to the inferior ſurface of the *os cuneiforme.* The *Inferior Surface* is ſubdivided, by a curved eminent line, into two leſs ſurfaces, which receive the two laſt metacarpal bones.

The Internal Tranſverſe Ligament of the *carpus* adheres to the four protuberances of that part.

The *Connection* of theſe bones is made in the following manner; with the bones of the fore-arm by arthrodia; with one another, by ſynarthroſis; and with the bones of the *metacarpus* by angular ginglimus.

The *Uſe* of the bones of the *carpus* is to facilitate the motion of the hand, and to fit it for its various offices.

Of the Metacarpus.

Next to the *carpus* is the *Metacarpus:* which is compoſed of five ſmall, cylindrical bones, placed between the *carpus* and fingers.

The *Figure* of the *Metacarpus* is quadrangular.

We may notice in the *Metacarpus*

Two Surfaces; the External, which is convex, forming the back of the hand; and the *Internal*, which is concave, forming the palm.

Four Margins; of which the *Poſterior* or *Superior* is turned towards the wriſt, and the *Anterior* or *Inferior* towards the fingers. The *External Margin* is in the ſame line as the thumb, and the *Internal* in the ſame as the little finger.

The Bones of the *Metacarpus*, like other cylindrical bones, are divided into

The *Body*, and

The *Anterior* and *Poſterior Extremity*.

The *Subſtance* of the metacarpal bones is alſo like that of other cylindrical bones.

All the extremities of the metacarpal bones that are turned towards the wriſt, the firſt only excepted, are triangular, covered with cartilage, and having ſmall cartilaginous *faſciculi* laterally.

The *Body* of theſe bones is narrow, and divided into three ſurfaces by three angles: the External Surface is convex, forming a part of the back of the hand, the other two turned inwards, are ſomewhat concave.

The anterior extremities, which are contiguous with the fingers, reſemble a little head, laterally flat, and covered with cartilage. Immediately under this little head, each bone has two obtuſe eminences.

The *Firſt Bone of the Metacarpus* is by ſome authors accounted the firſt phalanx of the thumb; and theſe authors refer only four

bones to the *metacarpus* ; but as its reſemblance to the other metacarpal bones is ſo great, it ſeems to us better to claſs it with them.

The *Poſterior Extremity* of this bone has cavities and eminences, for the reception of the eminences and cavities of the multangular bone.

The *Anterior Extremity*, or *Head*, is ſmooth above, but like the other bones of the *metacarpus*, and joined with the firſt phalanx of the thumb. It is the ſhorteſt and thickeſt bone of the *metacarpus*.

The other bone of the *metacarpus*, which extends to the fore-finger, is the longeſt of all. Its ſuperior or poſterior extremity to the *os multangulum minus* ; its inferior or anterior extremity is joined to the firſt phalanx of the fore-finger.

The *Third Bone of the Metacarpus* adheres to the *os capitatum* of the *carpus*, by its poſterior extremity ; and to the firſt phalanx of the middle-finger, by its anterior extremity.

The *Fourth Bone* is connected by its poſterior extremity with the *os unciforme*, and with the ring-finger by its anterior extremity.

The *Fifth Bone* of the *Metacarpus* is the leaſt of all, and ſhorter than the other three. Its poſterior ſurface is not triangular, as of the reſt, but is equally broad, and joined to the middle ſurface of the *os unciforme*. Its anterior extremity is connected with the firſt phalanx of the little-finger.

The firſt metacarpal bone is joined to the *os multangulum* of the *carpus*, by arthrodia; but the connection of the other bones of the *metacarpus* with the *carpus* is by angular ginglimus. Laſtly, they are all conjoined by their anterior extremities to the fingers, by arthrodia (119).

Of the Fingers.

The *Fingers* conſtitute the laſt and anterior part of the hand. There are five fingers belonging to each hand, which differ from one another in ſize and length.

They are placed at the anterior extremities of the metacarpal bones.

They reſemble in *Figure* an elongated pyramid, externally convex, and internally concave.

Each finger is compoſed of three bones; but the thumb conſiſts of two bones only, which are diſtinguiſhed into as many orders, or *Phalanges*. Again, the phalanges are of various magnitude, and are divided into the *Firſt* or *Poſterior*, the *Middle*, and the *Laſt* or Anterior.

The *Body* and two *Extremities* may be noticed of each of theſe, as of all other cylindrical bones.

(119) The metacarpal bones of children, at birth, are more ſmooth and ſtraight than of adults. At birth too their epiphyſes are cartilaginous. At four months after conception, they are ſo completely oſſified as to differ from thoſe of adults only in magnitude.

The

The *Thumb* has only two phalanges, for we have referred the firſt to the *metacarpus*. The *Firſt Phalanx* is excavated poſteriorly, covered with cartilage, and bounded on each ſide by ſmall eminences; it is contiguous with the firſt bone of the *metacarpus*. Its *Body* is ſomewhat bent, ſo that its external ſurface is convex, and its internal ſurface concave. In the concave ſurface there are two unequal lines to which the tranſverſe ligament adheres. The anterior extremity extending to the laſt or anterior phalanx, is formed like a pulley, is covered with cartilage, and poſſeſſed of a ſmall depreſſion on each ſide, and ſmall eminences to receive the poſterior extremity of the anterior phalanx.

The *Other Phalanx* is ſhorter than the former: its poſterior extremity has a double cavity, covered with cartilage, where the eminences of the pulley of the firſt phalanx are inſerted. The external ſurface of the body is ſmooth; its anterior extremity reſembles the margin of a hemiſphere, being altogether unequally ſemilunar.

The *Phalanges of the four other fingers* are very like one another, differing only in ſize. The phalanx of the fore finger ſcarcely differs in ſize from that of the little finger. The phalanges of the middle finger are the longeſt: thoſe of the little finger are the ſmalleſt and ſhorteſt. There is a like proportion between the fingers themſelves. In the phalanges of the firſt and ſecond order, the ſurfaces both

convex and concave, are more manifeſtly diſtinguiſhed than in the phalanges of the laſt order, in which the ſurfaces are very ſmooth. In the concave ſurface of the former, there is an uneven line, to which the tranſverſe ligaments, ſerving to keep the muſcles ſteady, are attached. This line, however, is not diſcernable in the laſt phalanges. The poſterior extremities of the firſt order have a round concavity, into which are received the bones of the *metacarpus*. The anterior extremities reſemble a pulley, and are joined with the phalanges of the ſecond order: both extremities are covered with cartilage.

In the poſterior extremity of the ſecond order of phalanges, there is a double excavation, in which the pulley above-mentioned of the firſt order of phalanges is always inſerted. Again, the anterior extremities of theſe are received by their *trochlea* into the excavations of the poſterior extremities of the laſt phalanges.

The Laſt Phalanges of the Fingers, like the laſt phalanx of the thumb, have ſemilunar margins, in which the tendons of the muſcles which move the fingers are inſerted ([120]).

The Connection of the firſt phalanges of the fingers with the bones of the *metacarpus* is arthrodia. The firſt phalanx of the thumb

([120]) The bones of the thumb and fingers are longer in oſſifying than thoſe of the *metacarpus*; but at five months after conception, they ſcarcely differ from thoſe of adults, except in magnitude.

is

is joined with the bone proper to it of the *metacarpus*, by angular ginglimus; and ſuch alſo is the union of the ſubſequent phalanges of the fingers.

The *Uſe* of the Fingers, in particular, is to ſupport the organ of touch; but they ſerve, with the bones of the *metacarpus*, and thoſe of the upper extremities, for the performance of labour, and the defence of the body.

Of the Bones of the Lower Extremities.

The *Two Lower Extremities* form the inferior part of the ſkeleton. They hang on each ſide, in a right line, from the *acetabula* of the *oſſa innominata*, and are divided into

The *Thigh*,

The *Leg*, and

The *Foot*; all which are formed of thirty bones.

Of the Os Femoris.

The *Os Femoris* is the longeſt bone of the body. It is the moſt cylindrical, the thickeſt, and the ſtrongeſt.

It is ſituated between the *acetabulum* of the *os innominatum*, and the *tibia*. It is not, however, placed altogether perpendicularly, but ſomewhat obliquely: ſo that the ſuperior extremities are at a greater diſtance from each other than the inferior (See Note 109).

In infancy, the Epiphyſes of this bone are manifeſtly conſpicuous ([121]). It is divided like other cylindrical bones, into its *Body*, or *Middle Part*, and its *Two Extremities.*

The *Body*, which inclines forwards, has three *Surfaces:* the *anterior*, which is convex, and the two *poſterior*, which are ſmooth, and ſeparated from each other by a long, prominent, but unequal line, extended downwards from both trochanters. This line is bifurcated inferiorly, and runs even to the inferior heads of the bone, producing there a ſmooth, triangular ſurface. Near this line likewiſe, there is one or more *foramina*, which lead into the cavity of the bone, and are the paſſages of veſſels to it.

The following *Eminences* and *Cavities* may be ſeen in the ſuperior extremity of the Thigh bone, viz.

1. The *Head*, which is a ſphere, is half covered with cartilage, extends obliquely inwards and ſomewhat upwards, to be received into the *acetabulum* of the *os innominatum:* nevertheleſs, the direction of this head is not the ſame in every ſkeleton. In the center of this ſpherical head, there is a ſmall depreſſion,

([121]) Its proceſſes at birth are all cartilaginous. It begins to oſſify, like the *os brachiale*, a month after conception, and has the ſame ſhape at four months as at nine: but its neck continues cartilaginous till about eight months. The inferior epiphyſis begins to oſſify between the eighth and ninth months, and is the firſt epiphyſis that oſſifies in the body, as Dr. Neſbitt ſays.

in

in which the *Ligamentum Rotundum* is inſerted.

2. The *Neck*, which is placed immediately under the head, is ſmaller above than below, being terminated in an unequal circle, to which the capſular ligament is faſtened, and two proceſſes, which are diſtinguiſhed by the name of *Trochanters*. The direction of this neck is more or leſs oblique, and the poſition of the head is conſequently various, as a more or leſs obtuſe angle is formed.

3. The *Great Trochanter* is a large, unequal eminence, grown together with the neck, inclined outwards, and oppoſite the head. Its external ſurface has very many inequalities for the inſertion of muſcles. Its internal ſurface is unequally hollow. In the baſe of this trochanter there is a particular, deep depreſſion; but the trochanter itſelf ends in an obtuſe point. Theſe parts ſerve for the attachment of the tendons of contiguous muſcles.

4. The *Small Trochanter*, which is turned inwards, is placed poſteriorly at the bottom of the neck. It has various eminences for the union of muſcles.

Between both trochanters poſteriorly there is a *longitudinal line*, by means of which the poſterior excavation is enlarged. There is likewiſe a line, anteriorly between the trochanters, at the end of the neck.

The *Inferior Extremity* is thick and broad, and has the following *Eminences* and *Cavities*.

1. Two

1. Two Large *Condyles* resembling a pulley, which are placed near each other anteriorly, but are at a distance from each other posteriorly, and are consequently divided into the *External* and *Internal* Condyle; of which the former is somewhat larger than the latter, though both are covered with cartilage.

2. The *Round Notch* placed posteriorly between the two condyles, forming the hollow of the ham, and containing and surrounding the popliteal vessels. Besides this notch, there is in each condyle

3. A *Semilunar Notch*, in which the crucial ligaments are fixed. There are many impressions besides for the adhesion of muscles. Laterally there is an eminence and many inequalities in each condyle. Anteriorly there is an excavation between both condyles, to receive the *patella*.

The *Substance* of the body of the thigh bone, as of all other cylindrical bones, is compact; that of the extremities is spongy, that of the cavity is reticular, and filled with marrow.

The *Os Femoris* is connected with three bones; it is connected by enarthrosis above with the *acetabulum* of the *os innominatum*, and by angular ginglymus below with the *tibia* and *patella*.

Its *Use* consists in its forming a principal part of each lower extremity.

Of the Leg.

The Leg is the other part of each lower extremity.

It is placed between the *os femoris* and the foot, and is formed of three bones, viz. The *Tibia*, the *Fibula*, and a ſmall round bone, called the *Patella.*

Of the Tibia.

The *Tibia* is ſituated between the *os femoris* and the foot, and extended downwards internally and anteriorly. Its figure is cylindrical and almoſt triangular. It is thicker above than below. Its two extremities are conſidered as epiphyſes in children.

It is *divided*, after the uſual manner of ſimilar bones, the ſubſtance of which is ſimilar, into a *Body*, and a *Superior* and *Inferior Extremity.*

The *Eminences* and *Cavities* in the Superior Extremity are the following, viz.

1. The *Head*, which is compoſed of two *Condyles*, one *External* and another *Internal*; both having a deep depreſſion above, lined with cartilage to receive both the condyles of the *os femoris.*

2. A *Double Eminence* between the condyles, for the attachment of the crucial ligaments.

3. The *Popliteal Notch*, which is deep, behind the condyles.

4. The

4. The *Spine of the Tibia*, which is placed anteriorly. The ligament of the *patella* is affixed to it; as is alſo the tendon of the *extenſores* muſcles, by which the *patella* is rendered firm.

5. The *Little Depreſſion*, in which the apex of the *patella* is ſeated, and under which is

6. The *Small Cartilaginous Surface*, which receives the *fibula* poſteriorly in the external condyle.

The *Inferior Extremity* is ſmaller than the ſuperior; it has the following *Eminences* and *Cavities*, viz.

1. The *Longitudinal Cavity* on the outſide, which receives the *fibula*.

2. The *Proceſs* on the inſide, which is called the *Internal Ancle*. There is a furrow in its extremity, in which the tendon of the *tibiaeus poſticus* muſcle is fixed.

3. The *Articular Cavity*, which is tranſverſe, and ſituated inferiorly in the extremity. It is lined with cartilage, and divided into two parts by a ſmooth eminence, rendered longer by the internal ancle. It receives the *aſtragalus*.

In the body there are three *angles*, and as many *ſurfaces*: (1.) the *Anterior angle*, which deſcends from the ſpine of the *tibia*, is acute above and ſpherical below: (2.) the *Two Poſterior Angles*, one of which is called *Internal* and *Poſterior*, being ſpherical and extended downwards to the internal ancle, and the

the other *External* and *Posterior*, the interosseal ligament adhering to this.

The Angles now mentioned separate three surfaces from one another: (1.) the *Internal Surface*, which is between the anterior and the internal and posterior angles is somewhat convex, and covered only by *periosteum* and common integuments: (2.) the *External Surface*, which is narrow, unequal, and limited by the anterior and the external, posterior angles: (3.) the *Posterior Surface* is bounded by the two posterior angles: at about the breadth of the palm of the hand from the condyles, there is a *foramen* in this bone, through which the artery enters its substance.

It is *connected* with four bones: above with the *os femoris* by angular ginglymus, and partly with the internal condyle of the *os femoris* by lateral ginglymus: inferiorly with the *astragalus* by arthrodia: laterally, above and below, with the *fibula* by amphiarthrosis and arthrodia.

The *Tibia* is of use in extending and bending the foot; and also in standing and walking.

Of the Fibula.

The *Fibula* is the other long bone of the leg. It is situated on the outside, but turned somewhat posteriorly, and almost opposite the external posterior angle of the *tibia*.

As to its *Figure*, it is long, cylindrical, small, and unequally triangular.

Its

Its *Structure* differs not from that of all cylindrical bones; and like them, it is divided into its *Body* and *Two Extremities* (122).

The *Superior Extremity* or the *Head of the Fibula* is ſmooth, and placed obliquely: it has an *articular ſurface*, covered with cartilage and turned inwards, by which it is joined to the *tibia*. It is terminated poſteriorly in an obtuſe point. Below the Head is the *Neck of the Fibula*.

The *Inferior Extremity* is broad, and rather oblong: it is almoſt triangular, forming the *External Ancle*, which deſcends further downwards than the internal ancle, and is covered internally with cartilage. The external ancle concurs to form the articular cavity for the reception of the *aſtragalus*. It has a *furrow* poſteriorly, in which the tendon of the *peroneus longus* and *medius* muſcles paſs.

The Body of the *fibula*, which is very ſmall, and bent ſomewhat inwards towards the middle, reſembles an unequal triangular. It has three *angles*, and as many *ſurfaces*.

To the *Internal Angle* the interoſſeal ligament adheres, and thence deſcends ſo as to come oppoſite the external poſterior angle of the *tibia*.

(122) The *Fibula* and *Tibia*, ſays Dr. Neſbitt, begin to oſſify in the ſame manner, and about the ſame time, as the thigh bone, and alſo gradually increaſe in the ſame manner, and much in the ſame proportion (p. 134.).

The *Fibula* is ſtraighter in children at birth than in adults.

The

The *External Superior* and the *External Inferior Angles* are more or leſs acute.

The *External Surface* is placed between the inferior and internal angle.

The *Poſterior Surface* is a little convex above; it is turned inwards inferiorly, together with the external ſurface, and it is ſurrounded by the ſuperior and external inferior angles.

The *Internal Surface* is included in the ſuperior and internal angles; but this ſurface is divided into two by an *oblique line.*

It is *connected* above and below by ſynarthroſis with the *tibia*, and below by arthrodia with the *aſtragalus.*

Its *Uſe.* It eſtabliſhes the connection with the foot, and renders it more ſecure.

Of the Patella.

The *Patella* is that little bone ſituated between the condyles of the *os femoris* over the *tibia*, and immediately upon its ſpine.

Its *Figure* is unequally triangular, and flat.

It is *divided* into its *Baſis*, *Apex*, *Sides*, and *Internal* and *External Surface.*

The *Baſe* is the thickeſt part of the bone, turned upwards to the *femur.*

The *Apex* is obtuſe and turned to the *tibia*, to the ſpine of which it is connected by a ligament and the ſtrong tendon before noticed. The apex has a ſmall, unequal depreſſion, in which

which the tendon already mentioned of the *extenſores* muſcles of the *tibia* is implanted.

The *External Surface* is convex and uneven, being notched towards the baſis.

The *Internal Surface* is concave, covered with cartilage, and divided, by a prominent line extended from the apex to the baſe, into two *articular depreſſions*, into which the *trochlea* of the *os femoris* is received.

The *Subſtance* of this bone is internally ſpongy, and covered externally with a thin *lamella* of compact ſubſtance ([123]).

It is *connected* with the *tibia* by ſyndeſmoſis, with the *trochlea* of the *femur*, through the interpoſition of the cartilaginous ſurfaces, by angular ginglymus.

Its *Uſe*. It renders the articulation of the *os femoris* with the *tibia* more firm, to prevent the body from falling forwards. It ſerves too as a pulley for the tendon of the *extenſores* muſcles of the *tibia*.

Of the Bones of the Foot.

The *Foot*, which is the laſt part of the ſkeleton, is compoſed of the *Tarſus*, *Metatarſus* and *Toes*.

We may obſerve in general, its *Internal* and *External Margin*; its *Anterior* and *Poſterior Extremity*; its *Convex Surface*, or the

([123]) The *Patella* is wholly cartilaginous at birth. The texture and inſertion of the ligaments of the *patella* are moſt conſpicuous in foetus.

Back of the *Foot*, and its *Concave Surface*, or the inferior part, or the *Sole of the Foot*.

Of the Tarſus.

The *Tarſus*, which is ſituated between the *tibia* and *metatarſus*, conſiſts of ſeven bones, viz. the *aſtragalus*, the *calcaneum*, the *os naviculare*, the *os cuboides*, and the three *oſſa cuneiformia*.

The largeſt of theſe bones are the two firſt. The two next are ſmall: but the laſt are ſmalleſt.

The *Aſtragalus* is placed poſteriorly and ſuperiorly; it is formed of two parts, the largeſt, or the *Body*, and the leſs, which is like a proceſs. That part where theſe two unite is called the *Neck*.

The *Body*, or poſterior part, has a *Superior* and an *Inferior Surface*, and two *Lateral Surfaces*. The Superior Surface is large, and covered with cartilage; it reſembles the half of a pulley, and is connected to the lower end of the *tibia*.

The *Internal* and *External Lateral Surface* ſeems to be a production of the ſuperior ſurface. The *External* is broader than the internal, and is covered by the external ancle. The *Internal Surface* has a large cavity, and is covered by the internal ancle. The *Inferior Surface* is concave and covered with cartilage; it receives the *calcaneum*. There is a furrow

in the external margin to which the capſular ligament is fixed.

The *Proceſs*, or anterior part, is divided from the body, by an excavation above and a large notch below. It has an *Anterior Surface*, obliquely convex, covered with cartilage, and attached to the *os naviculare*. There are two ſeparate cartilages belonging to the *inferior ſurface*, that are adapted to the *calcaneum*.

The *Calcaneum*, ſeated poſteriorly under the preceding, is the largeſt bone of the foot, and ſeems to form its baſis ([124]).

Its *Figure* is very irregular.

It is *divided* into its *Body* and its *Anterior* and *Internal Proceſs*.

There is a rough eminence poſteriorly in the body, to which the *Tendo Achillis* is attached.

The *Superior Surface* is divided into two parts; the poſterior which is unequal, and the anterior which is convex, covered with cartilage, and entering the concavity of the *aſtragalus*.

The *Inferior Surface* is narrow, having a double eminence poſteriorly, to which the plantar tendon is fixed.

([124]) Oſſification begins in the middle of the *aſtragalus* and *calcaneum*, or *os calcis* about the fourth or fifth month after conception.

At birth there are five cartilages ſupplying the place of the other bones of the *tarſus*.

The *Internal Lateral Surface* is a little excavated, ſo that the paſſage of veſſels, nerves, and tendons of certain muſcles may be more eaſy.

The *External Lateral Surface* is covered only by ligaments and common integuments.

Of the Anterior or Larger Proceſs we may notice

The *Uneven Excavation* above, covered with cartilage, receiving the proceſs of the *aſtragalus*.

The *Eminence* below, to which the *flexor brevis* muſcle of the fingers adheres:

The *Surface* before, covered with cartilage, partly concave, and connected to the *os cuboides*.

The *Very Unequal Surface* on the outſide, where there is an eminence and concavity in which the *abducens* muſcle of the little toe is fixed; and the *extenſ r brevis* of the toes.

The *Internal* or *Lateral Proceſs* coming from the body and larger proceſs. It enlarges the concavity of the internal ſurface of the *calcaneum*, and has a ſmall cartilaginous ſurface both above and below.

The *Os Naviculare* is ſituated internally before the *aſtragalus*. We may obſerve in it

The *Poſterior Surface*, which is concave, covered with cartilage, and receiving the convex ſurface of the *aſtragalus*.

The *Anterior Surface*, which is convex, and divided into three ſmaller cartilaginous ſur-

faces by two lines. Theſe receive the *oſſa cuneiformia.*

The *Round Extremity* on the inſide of the foot terminated in an obtuſe point. It is externally attached to the *os cuboides*. The tendons of two muſcles are affixed to it.

The *Os Cubiforme* is placed externally before the *calcaneum:* it has ſix *Surfaces.*

The *Superior Surface*, which is unequal, and placed towards the back of the foot.

The *Inferior Surface* in which there is an oblique *furrow*, to which the round ligament and the tendon of the *peroneus longus* muſcle are both affixed.

The *Poſterior Surface*, which is cartilaginous, broad, partly convex and partly concave, receiving the *calcaneum.*

The *Anterior Surface*, which is divided by a line, receives the fourth and fifth bone of the *metatarſus.*

The *External Surface*, which is the leaſt, and has a ſmall *ſulcus*, in which the tendon of the *gaſtrocnemius poſticus* muſcle is inſerted.

The *Internal Surface*, which is the longeſt, and has two leſs ſurfaces; one receiving the *os naviculare*, and the other the *os cuneiforme.*

The Three *Oſſa Cuneiformia* ſituated near one another, before the *os naviculare*; they are like wedges driven between the other bones, and are named accordingly. We take notice, in each bone, of the *Baſis, Apex*, and four

Surfaces.

Surfaces, one of which is *anterior*, another poſterior, and the other two *lateral*.

The *Firſt os Cuneiforme* is the largeſt. It is placed on the inſide of the foot, before the *os naviculare*.

Its *Baſe* is convex and turned downwards.

Its *Apex* is turned upwards towards the back of the foot.

The *Poſterior Surface* is almoſt triangular, concave, and united to the anterior and internal ſurface of the *os naviculare*.

The *Anterior Surface*, which is ſemilunar, receiving the firſt bone of the *metatarſus*.

The *Internal Surface* is unequal, connected above to the ſecond cuneiform bone, and below to the ſecond bone of the *metatarſus*.

The *External Lateral Surface* is unconnected.

The *Second Os Cuneiforme* is the leaſt: it is placed between the firſt and third, before the *os naviculare*.

Its *Baſis* is unequal, ſhort, and turned upwards.

Its *Apex* is turned downwards.

Its *Poſterior Surface* is triangular, and connected to the middle of the ſurface of the *os naviculare*.

Its *Anterior Surface* is contiguous with the other bone of the *metatarſus*.

Its *Internal Surface* is joined to the firſt cuneiform bone.

The *Third Os Cuneiforme* is ſituated between the ſecond *os cuneiforme* and the *os cuboideum.* We may notice in it

The *Baſis*, which is turned towards the back of the foot.

The *Apex*, which is turned downwards.

The *Poſterior Surface*, which is triangular, and joined to the external anterior ſurface of the *os naviculare.*

The *Anterior Surface*, which is alſo triangular, receiving the third bone of the *metatarſus.*

The *Internal Lateral Surface*, which is connected above to the other *os cuneiforme*, and below to the ſecond bone of the *metatarſus.*

The *External Lateral Surface*, which is united to the *os cuboideum.*

The *Subſtance* of all the tarſal bones is ſpongy.

They are *connected* to one another by amphiarthroſis: anteriorly with the metatarſal bones by ſynarthroſis. The *Calcaneum* is connected poſteriorly and ſuperiorly with the *tibia* and *fibula* by arthrodia.

The *Uſe* of theſe bones is to render the foot more flexible, and fitter for the performance of its offices.

Of the Metatarſus.

The *Metatarſus*, the other part of the foot, is compoſed of five cylindrical bones, which are

are placed contiguous to one another, between the *tarſus* and the toes.

Their *Figure* is oblong and quadrangular ([125]).

We may notice in them,

The *Superior Surface*, which is convex, and the *Inferior* which is concave.

The *Anterior Margin*, turned towards the toes, and the *Poſterior* towards the bones of the *tarſus*.

The Two *Lateral Margins*.

Each of theſe five bones, like all other cylindrical bones, is divided into its *Poſterior* and *Anterior Extremity*, and its *Body*.

The *Poſterior Extremities* are excavated, and joined to the bones of the tarſus.

The *Anterior Extremities*, which are convex, are united to the firſt phalanges of the toes. Both Extremities are covered with cartilage.

The Metacarpal Bones differ greatly from one another. The firſt is the thickeſt and ſhorteſt: the other four are longer: and the poſterior extremities of theſe are larger than the anterior.

The *Body* has three *Surfaces*, and as many Angles; it being triangular. One of the *Surfaces* is *Superior*, the reſt are *Lateral*.

([125]) The metatarſal bones begin to be formed about two or three months after conception, in the ſame manner as other cylindrical bones. At birth their form is the ſame as in more advanced age; but their extremities are cartilaginous.

Two of the Angles are on the ſides: the third is turned downwards.

Theſe bones are *connected* poſteriorly with the bones of the *tarſus* by angular ginglymus; anteriorly with the firſt phalanges of the toes by arthrodia.

As to their *Uſe*, they ſupport the body, when we ſtand erect: they conſtitute the back and bottom of the foot.

Of the Toes.

The *Toes* are the laſt part of the feet, and of the whole ſkeleton. They are placed at the anterior margin of the *metatarſus*, and diſtinguiſhed by the names of the *Great Toe*, the *Second*, the *Third*, the *Fourth*, and the *Fifth*, or *Little Toe* ([126]).

As to the *Diviſion*, *Figure*, and *Subſtance* of the toes, it agrees with that of the fingers: for each is divided into three phalanges; except the great toe, which has only two. The Phalanges of theſe are ſhorter than thoſe of the fingers.

The phalanges of the toes are *connected* with the bones of the *metatarſus* by arthrodia: but the connection of the phalanges of the ſecond ſeries with the phalanges of the firſt; and of

([126]) Theſe bones, like thoſe of the fingers, have cartilaginous epiphyſes at birth, on both ends. The greateſt part of the laſt bone of all the ſmall toes, ſays Dr. Neſbitt, is cartilaginous.

the phalanges of the third ſeries, with thoſe of the ſecond, is by angular ginglimus.

The *Uſe* of the toes is in walking, and in various motions of the body, in which they are as a *fulcrum*.

Of the Oſſa Seſamoidea.

The *Seſamoid Bones* have gotten their name, from the reſemblance which they bear to the *ſemina lini.* They differ much in ſize from one another. They are found particularly between the firſt and ſecond phalanges of the thumb and great toe. They ſometimes adhere to the condyles of the *os femoris*, the *os cuboides* of the *tarſus*, &c. (127).

The

(127) *Oſſa Seſamoidea* are uſually found in the following manner; one between the metacarpal bone, and the firſt phalanx of the little finger, adhering to the tendon of the *abductor* muſcle of that finger (Heiſter, *Comp. Anat. Nota* 1*. *Edit. Amſt.* 1748.): one or two at the ſecond joint of each thumb and great toe (*Ibid.*): one in the external, and one in the internal condyle of each *os femoris* (*Ibid.*): one at the connection of the *os cubiforme* of the *carpus* and *tarſus*, with the metacarpal bone of the little finger, and the metatarſal bone of the little toe (Bartholine, *Anat. Reform.* and Kulm, *Tab. Anat.*).

Schulzius relates that he ſaw one in a peculiar ſinus in the lateral proceſs of the firſt lumbar *vertebra*, on each ſide (*Heiſt. Com. Anat. Nota* 1*.).

It has been imagined by ſome, that the *Oſſa Seſamoidea* are mere oſſifications of tendinous and ligamentous parts, in conſequence of violent and long-continued preſſure (Monro's Oſteol.): hence, their number was thought to be greater in more advanced age. Dr Neſbitt, on the contrary, always found the places of theſe bones in

foetus,

The *Number* of them is uncertain.

Their *Subſtance* is ſpongy: they are covered with a thin but compact *lamella*.

The *Uſe*. They ſerve for pullies to the tendons; render their motion eaſier, and augment their ſtrength.

foetus, only three months after conception, ſupplied with cartilages of a ſimilar figure. And, moreover, he obſerves that—"there is not one ſingle bone, except the teeth, or one *epiphyſis* in an adult ſkeleton, which is not to be found in a full grown *foetus*, or in its place a cartilage of nearly the ſame ſhape (Hum. Oſteog. p. 137.)."

SYNDESMOLOGY.

SYNDESMOLOGY.

SECTION I.

Of the Recent Bones.

WE have already obſerved, that *Oſteology* is divided into two parts: of which, the one reſpects the *Dry Bones*, and the other the *Recent Bones:* we are now come to treat of the *Recent Oſteology* as it is called; in which is examined,

1. The *Internal* and *External Perioſteum*,
2. The *Cartilages*,
3. The *Marrow*,
4. The *Articular Glands*,
5. The *Synovia*,
6. The *Veſſels* and *Nerves*,
7. The *Ligaments*.

Of Perioſteum.

The *Perioſteum* is a thin, but ſtrong membrane, more or leſs tranſparent, and very elaſtic:

tic: extended over the internal ([128]) and external ſurface of bones. It covers all the bones of the body, except the teeth. Its *External Surface* is ſmooth ; but its *Internal Surface* is unequal, becauſe of the unequal ſurface of the bones to which it adheres. It is variouſly termed, as it covers different parts: thus, covering the *cranium*, it is called *Pericranium* ; covering cartilages, it is called *Perichondrium* ; and covering ligaments, it is called *Perideſmium*.

The *Structure* of this membrane, which has very many veſſels, is compoſed of different membranous layers, ſometimes more, and ſometimes fewer, placed one upon another. Again, theſe layers conſiſt of a ſeries of membranous fibres, which if examined apart, run in a parallel direction : but if examined in the intire *perioſteum* are firmly interwoven with one another.

The *Connection* of the *perioſteum* is this ; the internal ſurface of the *perioſteum* coheres very firmly, by means of veſſels, with the ſubſtance of the bones ; the external ſurface is connected with cellular membrane and muſcles. Since, however, in old people, many veſſels gradually diſappear, become dry, and change into

([128]) It is wrong to ſay there is an internal *perioſteum* ; for that which ſome have choſen to call by this name, is merely the membrane that contains the marrow : beſides, its ſtructure is very different from that of the membrane which covers the bones, and is the true *Perioſteum*.

fibres,

fibres, the connection of *periosteum* with bone is not so firm in them, as in young subjects.

The *Internal Periosteum* seems to arise from the vessels and nerves, which enter into the substance of bones, and are dispersed over their internal surface. This membrane, which is far thinner than the external *periosteum*, covers not only the marrow of cylindrical bones, but also entirely invests all the small caverns of bones (See Note 128.).

The *Arteries, Veins* (129), and *Nerves* (130) of

(129) The *Periosteum* is possessed of very many blood vessels, which are easily injected in *foetus*, and communicate one with another, somewhat like those of the intestines (Albinus *Icon. Oss. Foetus Hum. Fig.* CLXII. and *Annot. Acad. Lib.* III. *Cap.* XI.): but the *periosteum* of *foetus* is less compact than that of adults, and resembles a cobweb, as Haller has observed (*Sur la Formation des os Obs.* 12. 21. 27. 32. 41. 42. 49. 51. 58. 60. 66. 68. 70. 76. 89.).

(130) Though the *periosteum* has generally been thought to be replete with nerves, yet the more common opinion is that it is insensible. Haller says—" The Insensibility " of the *Periosteum* was formerly noticed by Cheselden, " &c." (*Acta Gotting. Soc. Reg. Vol.* II.). Nesbitt presumes that—" the great sensibility, with which it is endowed, is a sufficient proof of its being well provided " with nerves, though they are too small to be traced " (Hum. Osteog. p. 6.). Haller (*Mem. sur la Nat. sens. et irrit. Tome* I.), and Hunter (Medical Comment. Part. I. Chap. VIII. p. 64.), have both agreed not only that *periosteum* is without nerves; but also that experiments on healthy animals, and observation deduced from diseased animals, disprove the supposition of their presence.

Baron Haller says,—" I have torn, pricked, and burnt " *periosteum* a hundred times; but the animal did not " evince

of *perioſteum* ariſe from the contiguous parts. They are diſperſed every way in numerous ramifications, and reſemble a net-work. Some of them penetrate even the cavity of bones.

The *Uſe* of *Perioſteum* is

1. To receive and direct the veſſels, that they may ſecrete marrow into the internal parts of bones, and nouriſh them:

2. To connect epiphyſes with bones:

3. To be a place of inſertion for muſcles and tendons: nevertheleſs ſome tendons perforate the *perioſteum*, and adhere immediately to the bone.

4. To defend bones from the open air, and other hurtful cauſes; when a wound ſhall have been made down to them.

Of the Natural Colour of Bones.

The *Natural Colour of the Recent Bones* is various: ſome are white, ſome are red, and ſome are bluiſh. Beſides, the compact ſubſtance of bones is white: the ſpongy ſubſtance is red, and ſomewhat blue. Hence, the body

" evince the leaſt ſign of pain: and what is more, young " kids have continued ſucking: yet, if I pinched the " ſkin, they bore it impatiently, and became convulſed (*Acta Gott. Reg. Soc. Tom.* II.)."

As to the opinion that *perioſteum* is continued from the *dura mater*, an opinion which was particularly ſupported by Clopton Havers (*Oſt. Nov. Diſc.* I.); we ſhall hereafter endeavour to prove that this latter is not ſenſible: ſo that no argument whatever can be deduced from this, to prove the ſenſibility of *perioſteum*.

of

of cylindrical bones is white, but their extremities are always red.

Age likewife caufes a difference in the colour of bones. The bones of adults are generally white; but thofe of children are reddifh. This, however, is only faid of the body and compact fubftance of bones: for, in old people, the fpongy fubftance of bones is fomewhat brown.

In the prime of life, all the bones are manifeftly redder than in old age: for many veffels which are permeable in the bones of the former, and tranfmit red blood, gradually coalefce in the latter. But this is not meant univerfally of all fubjects of the fame age: for the various kinds of life produce a notable difference in this refpect. The bones of a man accuftomed to hard labour from childhood, become firm and compact fooner, from the continued motion; becaufe the veffels running between the bony *lamellae* are thereby compreffed, changed into fibres, and are confequently fooner white, than the bones of men, who lead an eafy and indolent life (131).

The *Teeth* of Europeans and others is of a greyifh pearl colour, like the *tunica albuginea* of the eye; but the Teeth and the *tunica albuginea* are both alike of a fnowy whitenefs, clearly diftinct from that of others, in Ethiopians.

(131) The appearance of the recent bones depends principally on the fize and number of blood-veffels, with which they abound; as may eafily be conceived.

The Bones of men, who have uſed mercurial inunction, or taken mercury inwards, to cure the venereal diſeaſe, are never ſo white as is requiſite to make an elegant ſkeleton; and can never be employed for ſuch a purpoſe.

A knowledge of the natural colour of the bones is very uſeful, and oftentimes altogether neceſſary to a Surgeon; not only becauſe of different diſeaſes and wounds, but alſo becauſe of operations performed in the vicinity of bones.

It muſt be noticed alſo, in this place, that it becomes a Surgeon to be well acquainted with the inequalities of bones; their roughneſs, hardneſs, and ſmoothneſs, left in a diſeaſed ſtate, he miſtake that which is natural for that which is unnatural.

Of Cartilages.

Cartilage is a firm, ſmooth, and elaſtic body, of a pearl colour, very cloſely attached to the extremities of bones, which it covers.

Its *Firmneſs* or *Hardneſs* is of a middle kind, between that of bone and ligament (132).

The *Subſtance* of cartilage ſeems to conſiſt of a coagulated and inſpiſſated jelly, inter-

(132) It is worthy of notice that the external part of cartilage is the ſofter and more elaſtic, as was long ago obſerved by Clopton Havers *(Oſt. Nov. Diſc.* V.). This is the cauſe, that injury ſo ſeldom happens in the joints from violent concuſſions.

ſperſed

ſperſed with peculiar fibres. It is at leaſt certain, that the component parts of cartilage are always of a cartilaginous, and never of a bony nature ([133]).

The *External Surface* of cartilage is ſmooth, equal, and inveſted by a thin membrane, which is called *Perichondrium,* and conſidered as a continuation of *perioſteum:* nevertheleſs it is much thinner than *perioſteum*, and ſeems endowed with leſs ſenſibility ([134]).

There are neither cavities nor cells in cartilage; conſequently, it contains no marrow, no medullary fluid. There are no pores manifeſt in it, but it has minute *foramina* for the paſſage of very ſmall veſſels ([135]).

Cartilages are divided in a threefold manner, according to their

1. *Figure*,

([133]) Dr. Neſbitt ſays—" The long macerations of " the great Anatomiſt Dr. Nichols ſeem to prove, that " cartilaginous ſubſtances are fibrous, although the " fineſt miſcroſcopes do not diſcover the diſpoſitions or " courſes of the fibres (Hum. Oſt. Lect. I. p. 8.)."

The diſſection of Embryos proves that cartilage is originally a very jelly, as has been obſerved by Neſbitt (Human Oſteog.), Albinus *(Icon. Oſſ. Foet. Hum.)*, Haller *(Deux Memoires ſur la formation des Os, fondes ſur des experiences)*, and other eminent Anatomiſts. It is proved from the analogy between jelly and cartilage, both appearing ſimple, and flexible, and differing only in this, that cartilage is more compact, and elaſtic. But if we recede from a mere ſurvey, and rely on experiments, it will be plain that this cartilage, of which we are now ſpeaking, is very different from what it ſeems to be (Note 135.).

([134]) *Perichondrium* is eaſily ſeparable in *foetus*.

([135]) Cartilage has blood-veſſels, as was obſerved by Havers *(Oſt. Nov. Diſc.* V.*)*. The cartilages that ſup-

 ply

1. *Figure*,
2. *Situation*, and
3. *Uſe*.

As to their *Figure*, they are convex or concave, hemiſpherical, ſemilunar, triangular, oblong, oval, or of no determinate figure.

Cartilages are called from their *Situation*, *interarticular*; becauſe they are placed in the articulation of bones. To this kind may be referred the Cartilages between the condyles of the *os femoris* and *tibia*, the cartilages in the articulation of the lower jaw; of the *ſternum* and clavicle, &c.

By reaſon of their *Uſe*, *Cartilages* are called *Obducentes*, when they cover the condyles at the extremity of a bone, or line articular cavities: or they are called *Uniting Cartilages*, when they unite two bones firmly together (136).

The

ply the place of bone in the adult, e. g. in the Noſe, Ribs, &c. and that which ſupplies the place of bone in *foetus*, are eaſily ſhown to be vaſcular (Note 136.). But the cartilage that covers the heads of bones ſerving for articulation, is only ſuppoſed to be vaſcular from its becoming yellow in jaundice, from its ulcerating, and from its uniting with other parts. This laſt kind of cartilage cannot be injected; neither does it become red in inflammation. It will not exfoliate, neither will it granulate. It is without ſenſibility. Conſult the Phil. Tranſ. Vol. 42. and Dr. Hunter's Medical Commentaries, Chap. VI.

(136) There are other kinds of cartilage, of which Leber has made no mention: one ſupplies the place of bone in *foetus*, and is only found in them, viz. the epiphyſes of bones: another is employed by nature inſtead

The *Use* of Cartilages is:

1. That by their ſmoothneſs, and the ſlipperineſs of their ſurface, they may enable the bones, connected by moveable articulation, to roll over one another with eaſe, and without friction; ſo that by this mechaniſm, articular motion is rendered freer.

2. That by their flexibility, they may acquire the form requiſite to various motions.

3. That being peculiarly elaſtic, they may reſume their natural ſituation, and form, upon the removal of preſſure. The elaſticity of the cartilages may likewiſe conduce to the eaſier and freer motion of joints.

4. They render the articulations lubricous, and preſerve them ſo.

5. Laſtly, they unite various immoveable bones firmly together.

Of Marrow.

The *marrow of bones* is a very fat, oily part of the blood, one while fluid and another while of a thicker conſiſtence, contained not only in the internal cells, but alſo in the medullary tubes of cylindric bones ([137]).

We

ſtead of bone in adults, where it gives form to parts, and is not ſo liable to be broken as bone, viz. the cartilaginous part of the noſe, external ear, *aſpera arteria*, and Xyphoid Cartilage. The diviſion of cartilages adopted by Leber is ſimilar to that of Celſus (*De Medic. Lib.* VIII. *Cap.* I.).

([137]) The uſe of the Marrow is ſaid, in Note (140), to be to ſupply the body with nouriſhment, when the blood

has

We have already ſaid that all the body, cells and ſmall caverns of bones are inveſted with an internal *perioſteum.* Now it is this which produces ſo many follicles or ſmall ſacks there, which are divided into cells and cellular veſicles fit to contain the marrow; all the orifices of which cells communicate freely one with another, ſo that the marrow when dried ſeems to reſemble a bunch of grapes, or a ſeries of ſmall globules connected together laterally. This texture does not differ much from that which is obſerved in other cellular parts containing fat, except that this which contains marrow is by far more fine and ſubtile.

Marrow is ſeparated from the blood by means of arteries, penetrating the ſubſtance of bones, and divided into innumerable, ſmall ramifications; by which it is depoſited in proper cells. The blood which remains, after the ſeparation of the marrow, is taken up and carried back by the veins, through the ſame paſſage, to the general maſs.

As age advances, the number of theſe ſmall veſſels decreaſes (138); for although the larger trunks

has ceaſed to do it. But there is a uſe of the marrow that may very properly be noticed here; which is that by filling up the cells and cavities of bones, it renders the bones ſtronger, and ſtill co-operates with the deſign of nature, in preſerving them lighter than if they were ſolid bone, without cells or cavities.

(138) From the experiments of Sir Clifton Wintringham, it is proved, that the force of the blood in the arteries decreaſes with age, and that the veins increaſe both

trunks of the veſſels, deſtined for the ſecretion of marrow, become daily greater as the body enlarges, the capillary ramifications ariſen from them are gradually obliterated; and, the redneſs of the marrow is more or leſs intenſe, in proportion as the number of theſe is greater or leſs. Hence the reaſon is evident, why marrow is red in infancy, yellowiſh in manhood, and watery and limpid in old age.

Marrow is inſenſible; but the cells, in which it is contained, are very ſenſible. This is evinced by painful diſeaſes which occur in the middle of bones ([139]).

The *Uſe of Marrow.* It tranſudes between the *lamellae* of bones, and leſſens their fragility; for it moiſtens them, ſo that they may eaſily yield, and conſequently reſiſt the force of external cauſes.

The truth of this is confirmed by experience, which teaches us that fractures happen more readily in men, whoſe *medulla* is corrupted, and eaſier in old than in young men, even though the latter be more frequently liable to them ([140]).

Marrow

both in denſity and ſtrength: ſo that it is clear how the extreme arteries, which depoſite the *Medulla*, gradually become collapſed and obliterated as the *Vis à Tergo* ceaſes to dilate them by driving the blood onwards.

([139]) Deventer, Ambroſe Paré, Du Verney, and others have aſſerted that marrow is ſenſible, but they could certainly mean only that the medullary membrane is ſenſible. Such is the opinion of Haller (*Mem. ſur les par. ſenſ. et irrit.*).

([140]) So ſay Haller (*Prim. Lin.* § XXIV.) and Sabatier (*Tome Prem. p.* 16.). But as their proofs are

derived

Marrow alſo prevents *anchyloſis*, by tranſuding through ſmall *foramina* into the cavity of joints, where, mixed with other liquors, it conſtitutes *ſynovia* ([141]).

The

derived from ſuch conditions of the veſſicles containing *medulla*, as can never exiſt during the life, or health of the part, their opinion avails nothing. We agree with Haller in attributing the tranſparency of the bones of an imperfectly prepared ſkeleton, or of diſeaſed bones in the living ſubject to the tranſudation of *medulla*; but we differ from him in ſuppoſing that a ſimilar tranſudation takes place in the living body. For we imagine, that the greaſineſs of bones, or any other ſign of tranſudation can only happen from a deſtruction of the medullary cells, in conſequence of putrefaction, or ſome other cauſe. Hall's experiments clearly prove that the fragility of bones is not leſſened by the marrow (London Med. Journal, Vol. 7. p. 157.).

Mr. Cruickſhank rejects the opinion of Leber, Sabatier, and Haller, and conſiders that an evaporation of the watery parts, and a conſequent dryneſs muſt neceſſarily precede the tranſudation of oil, even though the medullary membrane and cells be broken (Of the Abſorbent Syſtem, p. 12.): but we cannot aſſent to this explanation of Mr. Cruickſhank, as we are dubious, whether a bone moiſtened with the animal fluids refuſes to imbibe and tranſmit *medulla*, for the ſame reaſon as paper moiſtened with water does not ſuffer the paſſage of oil through its pores. We know no proof that the bones are nouriſhed by *medulla*, as aſſerted by ſome authors (*Halleri Elem. Phyſiol.*). But we have every reaſon to believe that the uſe of the marrow, as well as of the fat, is to be abſorbed into the ſyſtem, when the blood does not ſupply it with nouriſhment.

([141]) Such is likewiſe the opinion of Haller (*Primae Lineae* § XXIV.) and Sabatier (*Tome Premier*, *p.* 16.); who contend that marrow tranſudes through the thin cartilaginous ſhell covering the *epiphyſes*, which opinion was once embraced by Clopton Havers (*Diſc.* 3.), who confeſſes indeed that the pores are very ſmall, though numerous,

The Haverſian or Articular Glands.

Theſe are particular, ſoft and tender glands placed in the articulations. They are ſpoken of more fully in the Adenology.

Theſe glands have ſo commodious a ſeat in joints, that they may eaſily be preſſed, but can never be bruiſed, except by very great violence. They are ſituated generally at the margin of the capſular ligament; or in particular hollows and cavities of the joints.

The liquor of theſe glands emulged by gentle preſſure, and combined with other liquors, which flow into the cavity of joints, renders their motion eaſier, and obviates the exſiccation, friction and waſting of the cartilages.

numerous, and hard to be diſcovered. Moreover he ſays, he had a bone of a horſe, in which they were very conſpicuous; viſible to the naked eye.

Now modern Anatomiſts ſay nothing of ſuch pores; and ſhould it be granted, as it is, that cartilage is vaſcular, becoming yellow in jaundice, nevertheleſs if a cartilage be immerſed and ſoaked in a coloured liquor, it does not become tinged, although Haller ſhall have aſſerted it, upon the authority of his very good friend Benedict Stachelinus (*Elem. Phyſ. Tom.* I.).

Synovia.

Synovia is a liquor almoſt like the white of an egg, contained in the cavity of joints by the capſular ligaments.

It conſiſts of

1. The *mucilaginous liquor* of the articular glands:

2. The *oleaginous part of the marrow* which tranſudes through ſmall pores of the extremity of bones, into the cavity of joints: and

3. The *watery part*, which exhales from the ultimate ends of very ſmall arteries opening into joints, from the internal ſurface of the articular ligaments ([142]).

The *Uſe* of this liquor is, to keep all the parts of joints flexible, ſmooth and glib, that they may roll eaſily upon one another; hence it prevents the reciprocal attrition and concretion of the joints.

([142]) Dr. Monro thinks that *ſynovia* is furniſhed by inviſible exhalent arteries, by the ducts of *fimbriae* (hanging within the joints and *burſae mucoſae* from maſſes of fat,) and by oil exſuding from the adipoſe follicles by unknown, undiſcovered outlets. But Dr. Monro admits of an exſudation from adipoſe membrane, which we cannot; and he confeſſes that the oil is, at all times, ſo well incorporated with the mucilage, that he could not diſtinguiſh globules in *ſynovia*, when aided by the microſcope (A Deſcription of all the *Burſae Mucoſae* of the Human Body, &c.)! There is no proof that marrow, or oil, is neceſſary to the formation of *Synovia*.

Of

Of the Veſſels and Nerves of Recent Bones.

Bones have always their *arteries* and *veins* ariſing from contiguous parts. The arteries in *perioſteum* are diſtributed through all the external parts of bones, cartilages, ligaments and articular glands. They enter the interior ſubſtance of bones, through ſmall pores ſituated between their *lamellae*; they are again diſtributed in the internal *perioſteum*, extended over the cells of bones, like a net, and there ſecrete marrow, or a liquor like marrow (143).

Their *uſe* is to nouriſh the bone, and to ſeparate that oily liquor, which we call *medulla* (144).

The

(143) There are two orders of arteries in bones, the one external and diſtributed through their ſubſtance, the other entering the cavity of bones, and being diſtributed through the medullary membrane. Theſe two arteries do not often communicate with each other. It is the latter that is called the medullary artery.

(144) Mr. Cruickſhank obſerves alſo, that when a bone is diſeaſed, the lymphatic glands in its vicinity become inflamed and ſuppurate, which could not happen unleſs lymphatic veſſels aroſe from bones; beſides, he ſays, he injected the lymphatics of bones, which puts the matter out of doubt (page 49.).

OSTEOGENY treats of the formation and growth of bones. We have ſeen in the former chapter, *On the Veſſels and Nerves of Bones*, that bones are as vaſcular as moſt parts of the body, though from their opacity and the ſmallneſs of their veſſels, this can only be diſcovered after diſeaſe, or after putting bones previouſly injected, into diluted marine acid, ſo as to diſſolve the earthy part, and leave only the veſſels and membranous part behind, and afterwards preſerving them in oil of turpentine.

Haller,

The *Nerves* of bones alſo come from contiguous branches, enter the internal *foramina* before

Haller, and many others, have imagined that cartilage is indurated jelly, and that bone is nothing more than cartilage replete with earthy matter (Note 133.). This however is not true, for the places of the bones of the ſkull are not pre-occupied by cartilages, but by membranes. Beſides, if bones were nothing but cartilage filled with earth, why do we not obtain cartilage again, after ſoaking bones in diluted marine acid?

Dr. Neſbitt deſcribes two kinds of oſſification: viz. the one which takes place between membranes, as is the caſe in many bones of the *cranium*, and moſt of the flat bones, and the other which takes place in cartilage (Human Oſteogeny.).

Oſſification between membranes takes place in conſequence of the depoſition of bony particles in regular lines ſo as to form differently diſpoſed orders of lines, or fibres, according to the figure of bones. The oſſification of flat bones commences in their centre.

Oſſification in a cartilage takes place in the following manner. The cartilage becomes viſibly inflamed and vaſcular, bony matter is depoſited, and the cartilage, at leaſt the greater part of it, is abſorbed. The whole of the cartilage however is not abſorbed, for ſome of it remains and covers the extremities of bones. In cylindrical bones, oſſification begins in the middle and extends towards the extremities.

As the point of oſſification appears very vaſcular and inflamed, it is probable that theſe appearances depend on the depoſition of the earthy matter by the extremities of arteries. For Dr. Neſbitt ſays, that, in the veſſels going to the points of oſſification, and near to the points of oſſification, " you will rarely miſs feeling, by the point of a knife, bony particles (p. 19.)."

Du Hamel was of opinion that a bone is formed of the layers of *perioſteum* gradually oſſifying, in the ſame manner as timber is formed by the hardening of the white ſubſtance found between the inner bark and the wood. Du Hamel aſſerted that, on examining the bones of animals that had lived

before noticed, and extend themſelves throughout the internal and external parts of bones. Their preſence is manifeſtly evinced by the very ungrateful ſenſation which accompanies moſt diſeaſes of bones.

lived one while on madder, and another while on their ordinary food, he always found diſtinct layers of a red and white colour, correſponding in number and appearance with the times of their living on madder and ordinary food, and the duration of theſe times. But Detleff's experiments have ſince rendered it certain, that neither *perioſteum*, nor cartilage is tinged by madder.

It is moſt probable that the arteries themſelves form bone; and that they do it ſeems evident from the enlargement of cylindrical bones, the cavity of which is very ſmall in young animals, but becomes larger as the animals grow older, always, however, bearing a certain proportion to the ſize of the bones. This enlargement can only depend upon the depoſition of oſſeous matter on the ſurface, and the abſorption of oſſeous matter from the cavity of bones. Hence it is that the ſkull enlarges during growth, and that, in old perſons, the *alveoli* are abſorbed.

In the diſeaſe called *Necroſis*, when a part of a cylindrical bone is deſtroyed, nature ſeparates the dead from the living parts; and when the marrow is deſtroyed, nature forms a new bony cylinder, either in part, or entirely, according as a part or the whole of the marrow is removed (Troja, *De Novor. Oſſ. Regeneratione.)*.

SEC-

SECTION II.

SYNDESMOLOGY.

Of the Ligaments in general.

LIGAMENTS are white, ſtrong, and elaſtic membranes deſtined for the connection of bones, whether moveable or immoveable.

Ligament is thicker and ſtronger than common membrane, but neither ſo ſtrong nor ſo hard as cartilage; ſo that it ſeems to be of an intermediate nature between both (145).

The *Fabric* of Ligaments conſiſts of many very ſmall, robuſt fibres, interwoven one with another, which, according to their ſituation, form a *broad* or a *thin ligament*, or a *ligamentous expanſion.*

Ligaments are divided into,

1. *Articular*, properly ſo called, by which the extremities of two bones are joined together, to make a moveable articulation.

(145) Dr. Hunter obſerved that, "the marks of a cartilage are theſe; in the freſh ſubject it appears uniform, and without any viſible fibres; and, when cut in any direction, its ſurface appears ſmooth like wax or glue. But a ligament is a compoſition of viſible fibres, and, when cut through, has an uneven ſurface (Med. Obſ. and Inq. Vol. II. p. 333.)."

2. Li-

2. Ligaments, by which either two bones are connected by an immoveable union; or by which other parts, eſpecially muſcles adhere, and have their motion thereby facilitated.

To the former claſs belong

1. *Capſular Ligaments.* Theſe ariſe from the whole circumference of the extremity of one bone, and are affixed to that of another, in a ſimilar manner.

They connect bones, leſt they ſhould recede from the articulation, and they prevent the eſcape of *ſynovia:* ſuch, for example, are the ligaments which conjoin the *os femoris* with the *os innominatum*, the condyle of the lower jaw with the *os temporum*, &c.

2. Ligaments which do not embrace the whole circumference of a bone, but being only attached to ſome lateral part, connect it with another.

3. Ligaments, which though within a joint, yet ſerve to connect two bones together: for example, the crucial ligaments which connect the head of the *tibia* with the condyles of the *os femoris*; the round ligaments by means of which the head of the *os femoris* is confined in its *acetabulum*, &c.

The latter claſs comprehends

1. The *Ligaments* which connect two immoveable bones together: for example, the ligaments of the *os ſacrum*, &c.

2. The Ligaments connecting cartilage with bone: for example, thoſe by which the apex

apex of the *sternum* is joined with the cartilage of the seventh rib.

3. The Ligaments joined to bones and cartilages, yet serving for other parts, especially muscles, or their tendons, to retain them in their place, to direct them, confine them, and render their direction more determinate in some kinds of motion. Such are the annular ligaments, the transverse ligaments, Poupart's ligament, the interosseous ligaments, the *obturator* ligaments, the cervical ligament, &c. All of which are intended for the connection of muscles.

Ligaments have numerous vessels. The *Arteries* open upon their internal surface, and exhale a liquor, which united with *synovia*, keeps the ligaments always moist and flexible. The *Veins* absorb the residuary blood, and carry it into the general mass. These vessels, and likewise the *Nerves* always arise from adjoining parts ([146]).

It is plain then, from what has been said, that the motion of the bones of a joint is more easy and free, the less the ligaments are, and the weaker and longer they are; but on the contrary, that the motion is more limited,

([146]) Ligaments have very few blood-vessels or nerves. They have hardly any sensibility at all.

A Ligament differs not in its structure from a tendon; both are composed of glistening, inelastic fibres, and both are scarcely, if at all, sensible. A Ligament, however, differs from a tendon in this, that it connects bones to one another, but tendon connects muscles to bones.

in proportion as the ligaments are larger, or ſhorter, and more robuſt.

The *Uſe of ligaments.* Capſular ligaments connect two bones together, and obviate the efflux of *ſynovia.* The other ligaments join bones together, and preſerve them in their proper ſituation. Moreover, the tendons of muſcles are faſtened to ligaments.

The Ligaments of the Lower Jaw.

The Ligaments by which the condyles of the lower jaw are fixed to the articular cavities of the temporal bones, are theſe: viz.

1. The *Capſular Ligament*, which is compoſed of firm and ſtrong fibres, ariſing from the circumference of the articular cavity of the temporal bone, are attached to the cartilage within the articulation ([147]); and, at laſt, to the neck of the articular condyle of the lower jaw, in its whole circumference.

2. The *Lateral Ligament*, which ariſes from the internal ſurface of the angle of the lower jaw, near its poſterior *foramen*, and is fixed

([147]) Mr. Hunter, ſpeaking of this interarticular cartilage, ſays it is connected with the articular ſurface of the temporal bone and the condyle of the lower jaw, by two diſtinct ligaments, independent of the exterior capſular ligament mentioned in the text, which is common alike to both the temporal and inferior maxillary bone. That by which the cartilage is attached to the temporal bone is the more free and looſe, though both ligaments admit of an eaſy gliding motion on the ſurface of the temporal bone, and the condyle of the lower jaw (*Natural Hiſtory of the Human Teeth*, page 11.).

to

to the poſterior margin of the articular cavity of the temporal bone.

The Ligaments connecting the Os Occipitis with the vertebrae of the Neck.

The articular condyles of the *os occipitis* are confined to the articular cavities of the firſt cervical *vertebra*, and to the other *vertebrae* of the neck, by means of the following ligaments:

1. The *Capſular Ligament*, which ariſes on each ſide from the baſis of the articular condyles of the occipital bone, and are both inſerted near the margin of the articular cavities of the firſt *vertebra* of the neck.

2. The *Broad Anterior Ligament*, ariſing from the anterior margin of the great occipital *foramen*, adheres to the anterior arch of the firſt cervical *vertebra*, between the ſuperior oblique proceſs and the eminence which conſtitutes the body of this *vertebra*.

3. The *Broad Poſterior Ligament*, which is leſs firm than the former, ariſes from the poſterior margin of the great occipital *foramen*, and adheres to the poſterior arch of the firſt cervical *vertebra*, which is extended from the ſuperior oblique proceſs as far as the eminence which ſupplies the place of a ſpinous proceſs, in this *vertebra*.

4. The *Ligament of the odontoid proceſs*. It ariſes at the anterior margin of the great occipital

occipital *foramen,* and is affixed to the odontoid procefs of the fecond cervical *vertebra.*

5. The *Cervical Ligament* arifes by a very broad beginning from the pofterior protuberance of the *os occipitis*; as it defcends, it becomes lefs, and is connected to the fpinous proceffes of the *vertebrae* of the neck, by means of its extremities.

The Ligaments of the other Vertebrae.

All the *vertebrae* are joined together by the following ligaments, fome of which are *proper* to particular parts, and fome *common* to the whole fpine: viz.

1. The *Tranfverfe Ligaments of the firft vertebra of the neck,* which arife internally from each fide of the anterior margin of the firft cervical *vertebra,* are extended tranfverfely to the oppofite fide, and attached to the odontoid procefs of the fecond *vertebra* of the neck. Thefe ligaments retain the odontoid procefs, now mentioned in its proper fituation, while the head is turned to either fide.

2. The *Pofterior Common Ligament of the vertebrae.* This is ftrong and broad; it arifes from the firft cervical *vertebra,* covers the convex furface of all the *vertebrae,* adheres to them, and is laftly terminated at the *os facrum.*

3. The *Anterior Common Ligament of the vertebrae*; it is broad, takes its origin from the odontoid procefs of the fecond *vertebra* of

of the neck, covers the internal or concave ſurface of all the *vertebrae*, adheres to them, like the former, and is extended as far as the *os ſacrum*.

4. The *Interſpinal Ligaments*, which are ſhort and firm, running in the courſe of the ſpine, from one ſpinous proceſs to another, ſo as to connect them all together.

5. The *Intervertebral Ligaments*. They ariſe from the margins of the *vertebrae*, begin at the ſecond *vertebra* of the neck, and paſs in a decuſſated direction from one *vertebra* to another.

6. The *Intertranſverſe Ligaments*, which are ſhort and ſmall, placed between the tranſverſe proceſſes, and paſs from the apex of one tranſverſe proceſs to that of another, ſituated above it.

7. The *Capſular Ligaments of the oblique proceſſes*, which adhere on all ſides to the oblique proceſſes.

8. The *Ligaments which connect the laſt vertebra of the loins to the os ſacrum*. Theſe are of the ſame kind as thoſe belonging to the other *vertebrae*. They join the *os ſacrum* with the laſt lumbar *vertebra*.

The Ligaments by which the Ribs are connected with the Sternum.

The two following ligaments are proper to the *Sternum*, beſides thoſe which join the clavicle and ribs with it, of which mention is made hereafter.

1. The

1. The *Proper Membrane of the ſternum*, is a firm, tendinous expanſion, compoſed of longitudinal fibres, and covering the external and internal ſurface of the *ſternum.*

2. The *Ligaments of the Xyphoid cartilage*, which ariſe, one on each ſide, from the cartilages of the ſeventh ribs, and contiguous parts of the *ſternum*, and deſcend from thence obliquely to be inſerted into the Xyphoid cartilage.

The *Ribs* are united poſteriorly with the *vertebrae*, and anteriorly with the *ſternum*, by means of ligaments.

The *Ligaments faſtened to the poſterior extremities of the ribs*, are theſe: viz.

1. The *Capſular Ligaments of the great heads of the ribs*, which ariſe from around the great head of each rib, and end by broad fibres in the circumference of the articular cavities of the *vertebrae.* Therefore the greater heads of the ribs are united with the bodies of the *vertebrae*, by means of theſe ligaments.

2. The *Capſular Ligaments of the ſmall heads of the ribs*, which ariſe from the circumference of the ſmall head of each rib, their extremities being connected with the articular cavity in the apex of each tranſverſe proceſs of the dorſal *vertebrae.*

3. The *Internal Ligaments of the neck of the ribs*; they begin at the ſuperior margin of the neck of the ribs, and end on the inferior

ſurface of the tranſverſe proceſs of the dorſal *vertebra*, next above it.

4. The *External Ligaments of the neck of the ribs*; they ariſe from the external ſurface of the ſuperior margin of the neck of all the ribs, aſcend obliquely, and are inſerted into the external margin of the inferior oblique proceſs of the dorſal *vertebrae*, placed above it. This ligament is wanting in the firſt dorſal *vertebra*.

5. Two *Peculiar Ligaments*; which having ariſen by broad fibres from the inferior margin of the laſt rib, are connected with the tranſverſe proceſs of the firſt and ſecond lumbar *vertebrae*.

The *Ligaments faſtened to the anterior extremities of the ribs*, are theſe: viz.

1. The *Capſular Ligaments of the cartilages of the true ribs*; which ariſe, on all ſides, from the extremities of the cartilages of the ſeven ſuperior true ribs, and are terminated in the circumference of the articular cavities of the *ſternum*. Many fibres go from the anterior ſurface of theſe ligaments, and run over the external ſurface towards the oppoſite ſide, like rays.

2. The *Proper Ligaments of the ribs*; by which the ribs cohere to one another; they deſcend from one cartilage in a direction directly perpendicular to another; they are united to theſe, and the cartilages of the five inferior ſpurious ribs are joined one to another.

The

The Ligaments of the Bones of the Pelvis.

The *Ligaments* by which the *Offa innominata* are joined with each other, and with the *os coccygis* and *vertebrae* of the loins, are thefe: viz.

1. The *Three Pofterior Ligaments of the os ilei*, or the *Ileo-facral Ligaments*, which are thick and ftrong, arife from the pofterior iliac fpine, defcend from thence obliquely, and terminate in the firft, third and fourth fpurious tranfverfe procefs of the *os facrum*.

2. The *Two Sacro-ifchiatic Ligaments*; which arife by a broad beginning from the fourth fpurious tranfverfe procefs, the lateral part of the *os facrum*, and the bafis of the *os coccygis*; their fibres are contracted as they defcend, are broader anteriorly, and inferted obliquely into the fpines of the *os ifchii*.

3. The *Superior and Inferior tranfverfe ligament of the pelvis*; thefe two ligaments arife from the pofterior margin of the *os ilei*, pafs tranfverfely in fuch a manner, that the fuperior is extended to the tranfverfe procefs of the laft lumbar *vertebra*, and the inferior to the firft tranfverfe procefs of the *os facrum*.

4. The *Obturator Ligament of the foramen ovale*; it arifes from the furface of the margin of the *foramen ovale*, and has an aperture in the fuperior part of the *foramen ovale*, for the paffage of the *obturator* veffels and nerves,

This place is likewise the seat of some kinds of *herniae*.

5. The *Inguinal Ligament*, or *Poupart's* or *Fallopius's Ligament*. This strong ligament consists principally of the tendinous expansion of the oblique descending abdominal muscle. It arises from the inferior iliac spine, and is terminated at the *crista* of the bones of the *pelvis*. The femoral vessels go from the *pelvis* under this ligament, and the *Herniae*, which are called *Femoral*, are in this place.

6. The *Capsular Ligament of the os coccygis*; which surrounds the basis of the *os coccygis*, and the apex of the *os sacrum*.

7. The *Longitudinal Ligaments of the os coccygis*; they arise from the internal surface of the *os coccygis*, and terminate in the *os sacrum*. These three ligaments render the connection of the *os coccygis* with the *os sacrum* more firm.

Ligaments of the Clavicle and Scapula.

The *Clavicle* adheres anteriorly with the *sternum* and first rib; posteriorly with the *scapula* by means of the following ligaments:

1. The *Interclavicular Ligament*, which is narrow, long, and strong, runs along behind the *sternum* from the anterior extremity of one clavicle to another.

2. The *Anterior Capsular Ligaments of the Clavicle*. These are two short robust ligaments arising on each side from the circumference

ference of the anterior extremity of the clavicle, and terminating in the margin of the articular cavity of the *ſternum*, which receives the clavicle.

3. The *Rhomboid Ligaments*, which ariſe on each ſide from the inferior rough ſurface of the anterior extremity of the clavicle, and paſs obliquely from hence to the firſt rib, to be attached to its cartilage.

4. The *Poſterior Capſular Ligaments*, which are ſmall but ſtrong, embracing the poſterior extremity of the clavicle and the *acromion ſcapulae*, and connecting them to each other.

The *Scapula* is joined with the poſterior extremity of the clavicle by the following ligaments:

1. The *Trapezoid Ligament of the Scapula*, which ariſes from the internal ſurface of the coracoid proceſs, is inſerted into the poſterior extremity of the clavicle.

2. The *Conoid Ligament of the Scapula*; it ariſes from the root of the coracoid proceſs, and is inſerted into the rough eminence of the poſterior extremity of the clavicle.

3. The *Proper Anterior Ligament of the Scapula*. It ariſes from the external ſurface of the coracoid proceſs, and is attached to the poſterior margin of the *acromion*.

4. The *Proper Poſterior Ligament of the ſcapula*. It ariſes from the middle of the ſuperior margin, and terminates at the root of the coracoid proceſs.

The Ligaments of the Shoulder.

As the ſuperior extremity of the *humerus* adheres to the cavity of the *ſcapula* by means of ligaments, ſo does the inferior to the bones of the fore-arm.

The *Capſular Ligament of the Shoulder* ariſes by a circular beginning from the head of the *os humeri*, and adheres on every ſide to the margin of the glenoid cavity of the *ſcapula*. There is a longitudinal opening in the ſuperior part of this ligament, through which the ſecond tendon of the *biceps* muſcles paſſes downwards to the ſuperior part of the articular cavity. Moreover, this ligament is augmented by tendinous fibres from the tendons of contiguous muſcles.

The Ligaments of the Bones of the Fore-arm.

The Bones of the fore-arm are joined to the *os humeri*, to one another, and to the *carpus* by various ligaments.

The *Ligaments of the cubit* are,

1. The *Capſular Ligament*, which ſurrounds the inferior extremity of the *os humeri*, deſcends upon its condyles, and attaches itſelf to the ſharp margin of the cubital tubercle and *corona*, and to the capſular ligament of the *radius*.

2. The *Brachio-cubital*, or the *Internal Lateral Ligament*; which ariſes from the ſuperior and anterior eminence of the articular condyle of the *os humeri*, deſcends over the

the capſular ligament, and is implanted in the internal ſide of the coronoid proceſs of the *ulna*.

3. The *Brachio-radial*, or the *External Lateral Ligament*. It ariſes from the internal condyle of the *os humeri*, aſcends over the capſular ligament, and unites with the coronary ligament of the *radius*, by expanded fibres.

The *Ligaments of the radius* are,

1. The *Coronary* or *Orbicular Ligament*, which begins at the poſterior margin of the ſemirotund cavity of the *ulna*, and is inſerted near the circular margin of the ſuperior head of the *radius*.

2. The *Capſular*, or *Sacciform Ligament*. It ariſes anteriorly from the margin of the ſemilunar notch in the inferior extremity of the *radius*, and looſely inveſts the whole head of the *ulna* poſteriorly. Theſe two ligaments concur to facilitate the motion of the *radius*, inwards and outwards.

3. The *Capſular Ligament*. This ariſes from the circumference of the margin of the glenoid cavity at the inferior extremity of the *radius*, and inferior head of the cubit. It encompaſſes the firſt three bones of the *carpus*.

4. The *Two Tranſverſe Ligaments*. One of theſe paſſes downwards from the articular cavity of the *ulna* to the unciform and cuneiform bones of the *carpus*, the other goes from the ſtyloid proceſs of the *radius* to the *os naviculare*.

5. The *Oblique Ligament*. It ariſes from the ſmaller protuberance of the *ulna*, obliquely fills

fills the ſpace intercepted ſuperiorly by the interoſſeous ligament, and goes and attaches itſelf to the *radius* and its tubercle.

6. The *Interoſſeous Ligament*. It is broad and ſtrong, filling the ſpace between the *ulna* and *radius*. It is affixed to the internal angle of the *radius*, and to the external angle of the ulna. It intercepts a ſpace, as hath been obſerved, near the ſuperior extremity of the bones of the Fore-arm, which ſpace is occupied by the oblique ligament.

This ligament is compoſed of fibres mutually decuſſating one another, and intercepting ſmall ſpaces here and there, through which veſſels paſs. Many muſcles adhere to the two broad ſurfaces of this ligament.

Ligaments of the Carpus.

The *Bones of the wriſt* are united with one another, with the fore-arm, and the bones of the *metacarpus* by the following ligaments.

The *Proper Ligaments of the wriſt* are,

1. The *Capſular Ligament, common to the carpal bones*, or that by which the firſt ſeries of bones in the *carpus* is joined with the ſecond.

2. The *Short Ligaments of the bones of the carpus*. Theſe are ſmall and ſhort ligaments, by which the bones of the *carpus* are connected into one continued ſeries, and theſe ſeries connected together. They are called *oblique, tranſverſe, capſular*, and *proper ligaments of the bones of the wriſt*.

We

We have already ſpoken of the *Ligaments*, which connect the *carpus* with the fore-arm; and, as for thoſe which connect it with the metacarpal bones, we ſhall mention them in ſpeaking of the *ligaments of the metacarpus*.

Ligaments of the Metacarpus.

The Bones of the *metacarpus* are united poſteriorly with the bones of the *carpus*, and with one another. This union is made by

1. The *Articular Ligaments*; theſe are ſhort and firm, ſerving to connect the ſecond ſeries of carpal bones with the poſterior extremity of the metacarpal bones. According to their various ſituation, and the different direction of their fibres, they are called *lateral*, *ſtraight*, *perpendicular*, &c. *ligaments* of the back of the hand.

2. The *Interoſſeous Ligaments of the metacarpus*. Theſe are ſmall, ſerving for the union of the anterior and poſterior extremity of one metacarpal bone with the poſterior and anterior extremity of another.

Ligaments of the Fingers.

Ligaments connect the phalanges of the four fingers with one another, with the bones of the *metacarpus*, but the thumb with the greater *os multangulum* of the *carpus*.

1. The *Capſular Ligaments of the phalanxes of the fingers*. Theſe join the anterior extremities of the bones of the *metacarpus* with the

the poſterior extremities of the firſt ſeries of the phalanxes of the four fingers. Hence they paſs from one phalanx of the fingers to another, and confine them all together.

2. The *Lateral Ligaments of the phalanxes of the fingers*, which are ſtrong, one of them, on each ſide, paſſing from one bone to another, placed above it, to be inſerted in the capſular ligament of the joint.

3. The *Capſular Ligament of the thumb.* It bounds the poſterior extremity of the firſt phalanx of the thumb, and adheres, in its whole extent, to the *os multangulum magnum* of the *carpus*.

Of the Ligaments, which preſerve the Tendons of the Muſcles of the Hand in their proper Place.

They are the following;

1. The *External Tranſverſe Ligament of the wriſt.* This ſtrong ligament ariſes from the piſiform bone of the *carpus*, and the ſtyloid proceſs of the cubit, deſcends tranſverſely on the back of the hand, and being more expanded, it terminates there on the external ſurface, and in the ſtyloid proceſs of the *radius*. It ſends off ſome fibres, which paſs over the *abductor* muſcle of the thumb: and the tendons of the *extenſor* muſcles of the *carpus* and fingers paſs between it and the bones.

2. The *Tranſverſe Ligaments of the extenſor tendons*, or the ſix *Vaginal Ligaments of Winſ-*

low.

low. Theſe ſhort Ligaments are ſituated under the former, being attached not only to them, but to the bones, and cover the tendons of the *extenſor* muſcles, like a ſheath.

3. The *Tranſverſe Ligaments of the extenſor tendons*. Theſe are ſhort, being extended acroſs the back of the hand, from one tendon to another.

4. The *Internal Tranſverſe Ligament of the Carpus*. This ſtrong and firm ligament adheres to the four eminences, on the internal ſurface of the *carpus*. The tendons of the *flexor* muſcles of the fingers go under this ligament.

5. The *Tranſverſe Palmar Ligaments*. They are faſtened to the heads of the metacarpal bones, paſs from thence tranſverſely, cover the *lumbricales* muſcles of the *metacarpus*, and end in the metacarpal bones, and vaginal ligaments of the *flexor* tendons.

6. The *Vaginal Ligaments of the flexor tendons*. Theſe ariſe from the internal tranſverſe ligament, ſurround the tendons, like a ſheath, and paſſing together with them over the palm of the hand, they go to the ends of the phalanxes of the fingers, where they end, together with the tendons of the *perforans* muſcle.

7. The *Vaginal* or *Crucial Ligaments of the phalanxes*. Theſe paſs, in a tranſverſe and decuſſating direction, over the vaginal ligaments of the *flexor* tendons, from one margin to another of the oppoſite ſide of a phalanx. Therefore, by adhering to the margins of phalanxes,

phalanxes, they keep the tendons more firmly in their place.

8. The *Acceſſory Ligaments of the flexor tendons.* Though theſe ligaments be ſmall, they are firm. They ariſe from the firſt and ſecond phalanxes of the fingers. They are ſecluded by the vaginal ligaments of the tendons, and are loſt in the tendons of the *perforatus* and *perforans muſcle.*

Ligaments of the Articulation of the Os Femoris with its Acetabulum.

The Two Ligaments, which connect the head of the thigh bone with the *acetabulum* of the *oſſa innominata*, are the ſtrongeſt and firmeſt of the whole body.

1. The *Capſular Ligament*, which is large, thick, and very ſtrong, ariſes from the whole circumference of the margin of the *acetabulum*, and from the inferior iliac ſpine: it deſcends over the head of the *os femoris*, and is connected by a circular inſertion to its whole neck and baſis.

2. The *Ligamentum Teres*, or *Round Ligament.* This is ſtrong, firm, and not perfectly round, but ſomewhat flattened. It ariſes within the articulation from the cavity of the *acetabulum*, and is inſerted into a ſmall depreſſion, conſpicuous in the head of the *os femoris.*

The

The Ligaments of the Articulation of the Os Femoris with the Tibia, Fibula, and Patella.

The Ligaments, by which theſe three bones and the intermediate ſemilunar cartilages are joined together, are theſe:

1. The *Internal Lateral Ligament*. This is broad enough. It ariſes from the external ſurface of the internal condyle of the *os femoris*, and after deſcending about the breadth of four fingers, is inſerted into the ſuperior part of the internal condyle of the *tibia*.

2. The *External Lateral Ligament*. This is not ſo broad, but it is thicker than the preceding. It ariſes from the external ſurface of the external condyle of the *os femoris*, then deſcends, and terminates in two leſs ligaments; the larger of theſe is connected to the external ſurface of the external condyle of the *tibia*; the leſs is joined ſuperiorly to the head of the *fibula*.

3. The *Capſular Ligament*. It ariſes ſuperiorly from the whole circumference of both condyles of the *os femoris*: inferiorly it is connected to the margins of the condyles of the *tibia*, and anteriorly to the whole margin of the *patella*, which ſerves the end of a capſular ligament in this place. This ligament is much enlarged anteriorly from the expanſion of a broad *faſcia*, and the tendons of adjacent muſcles.

4. The

4. The *Posterior Ligament.* This arises posteriorly from the eminence of the external condyle of the *os femoris*, it descends obliquely over the capsular ligament and is inserted under the internal condyle of the *tibia.*

5. The *Great* and *Small Alar Ligaments.* Such are two broad ligaments resembling wings, formed of a doubling of the capsular ligament. They adhere to the sides of the *patella*, and are lost in the fat of that place.

6. The *Crucial Ligaments.* These are two strong ligaments situated within the capsular ligament, which decussate each other. The *Anterior Ligament* arises from the eminences between the superficial cavities of the condyles of the *tibia:* it ascends obliquely thence, to be implanted in the semilunar depression of the external condyle of the *os femoris.* The *posterior ligament* arises from the same eminences, ascends obliquely through a notch between both the condyles of the *os femoris*, and is affixed to the semilunar depression of the internal condyle of the *os femoris.*

7. The *Ligaments of the Semilunar Cartilages.* This is a name, which two ligaments have gotten, because they connect the semilunar cartilages, situated between the condyles of the *os femoris*, and the superficial articular depressions of the *tibia*, with one another, and with the *tibia* and *femur.*

These cartilages have ligaments, and other smaller ligaments, by means of which they are joined to the tubercles of the *tibia*, and

alſo to the ligament connecting them together.

8. The *Ligament of the Patella.* This is a ſtrong ligament, ariſing from the notch in the apex of the *patella*, and, deſcending perpendicularly, is inſerted into the anterior ſpine of the *tibia.*

Ligaments of the Fibula.

The Ligaments uniting the *fibula* with the *tibia*, are

1. *The Capſular Ligament of its ſuperior extremity.* This ſurrounds the head of the *fibula*, and adheres to the internal condyle of the *tibia.*

2. The *Interoſſeous Ligament*; which is broad and ſtrong, and extended and confined between the *tibia* and *fibula*, like the interoſſeus ligament of the fore-arm. It is affixed from hence to the whole poſterior angle of the *tibia*, and from thence to the internal angle of the *fibula*. It is compoſed of ſtrong fibres, firmly interwoven one with another; which have ſmall interſtices, here and there, for the paſſage of veſſels. Superiorly it leaves an aperture, which is covered by muſcles placed on each ſide: and its broad ſurfaces ſerve for the attachment of muſcles going to the bottom of the foot.

3. The *Ligaments of the Inferior Extremity.* Theſe are four, which are ſhort, ſtrong, and firm: two of them are ſituated anteriorly,

and two poſteriorly. They extend obliquely from the *tibia* to the *maleolus* of the *fibula*.

Ligaments of the Tarſus.

The Ligaments which join the *aſtragalus* with the *tibia* and *fibula*, are

1. The *Anterior Ligament of the Fibula*. This ariſes from the anterior ſurface of the external ancle, paſſes obliquely forward, and is inſerted ſuperiorly into the proceſs of the *aſtragalus*.

2. The *Middle Ligament of the Fibula*. It ariſes from the top of the external ancle, deſcends perpendicularly, and ends in the external, lateral ſurface of the *os calcaneum*.

3. The *Poſterior Ligament of the Fibula*. This Ligament having ariſen from the lowermoſt, and hindermoſt margin of the external ancle, is inflected obliquely backward, and implanted in the proceſs of the *aſtragalus*.

4. The *Deltoid Ligament of the Tibia*. This ariſes from the margin of the *tibia*, and the top of the internal ancle, and terminates at the proceſs of the *aſtragalus*, and the prominent circumference of the *os naviculare*.

5. The *Capſular Ligament*. It ariſes from the whole circumference of the articular cavity of the *tibia*, and adheres, on all ſides, to the *aſtragalus*.

Ligaments of the Metatarſus.

The Bones of the *metatarſus* are joined to one another, and to the *tarſus* poſteriorly, by the following ligaments, viz.

1. The *Capſular Ligament*, which connects the metatarſal bone of the great toe, with the cuneiform bone of the *tarſus.*

2. The *Articular Ligaments*, which connect the poſterior extremity of the bones of the *metatarſus* with thoſe of the *tarſus.* The many ligaments of this part, are variouſly denominated according to their ſituation, for example, *plantar ligaments*, *dorſal ligaments of the foot*, *lateral ligaments*, &c.

3. The *Tranverſe Ligaments of the back of the foot.* Such are three ligaments placed tranſverſely upon the back of the foot, in ſuch a manner that, one of them is always received between two bones of the *metatarſus.*

4. The *Tranſverſe Ligaments of the bottom of the foot.* There are three of theſe alſo, which are united with the bones of the *metatarſus* on the bottom, as the former are on the back of the foot.

5. The *Interoſſeous Ligaments of the Metatarſus.* Theſe three ligaments are placed like the former, but laterally between the bones of the *metatarſus.*

Ligaments of the Toes.

The Toes are connected together and with the bones of the *metatarſus*, by the following ligaments, viz.

1. The *Capſular Ligaments*, which ſurround the poſterior extremities of the firſt ſeries of the phalanxes of the toes, and the anterior extremities of the bones of the *metatarſus*; they ſurround alſo, in the ſame manner, the extremities of the other phalanxes; and conſequently, join the phalanxes with the anterior extremities of the metatarſal bones, and with one another.

2. The *Lateral Ligaments*. Theſe paſs from the ſides of the phalanxes, from one to another, and adhere every where to the articular capſules.

All theſe ligaments, in the ſame manner as in the hand, increaſe upon the back of the foot, from an expanſion of the tendons of the *extenſor* muſcles; and on the bottom of the foot, from an expanſion of the tendons of the *flexor* muſcles.

The Ligaments which retain the Tendons of the Foot in their proper place.

As the Tendons of the muſcles of the hand, ſo thoſe of the back and bottom of the foot are confined by means of ligaments, leſt they ſhould be drawn from their proper place during violent motions. Theſe Ligaments are

1. The

1. The *Vaginal Ligament of the Tibia*, which is very ſtrong, ariſes from the internal angle of the lower extremity of the *tibia*, ſurrounds the tendons of the muſcles placed there, and terminates on the external ſurface of the *fibula*.

2. The *Tranſverſe* or *Crucial Ligament of the Tarſus*. This is double; the one ariſes on the external ſide of the foot above the external *malleolus* of the *fibula*; the other from the proceſs of the *os calcaneum:* theſe two ligaments are decuſſated at the junction of the *tibia* and *tarſus*, the former being affixed to the internal ancle, the latter to the internal ſurface of the *os naviculare*. The tendons of the muſcles of the toes are kept in their right poſition by this ligament.

3. The *Ligament of the tendons of the Peronei muſcles*. This ariſes from the anterior part of the heel, and is inſerted into the external ſide of the eminence of the *os calcaneum*.

4. The *Lancinated Ligament*. It ariſes from the circumference of the internal ancle, is expanded in rays, and its fibres, being ſeparated one from another, are loſt in the adjacent fat, in the proper membrane of the *abductor* muſcle of the great toe, and laſtly in the internal ſurface of the *os calcaneum*. It encloſes the tendons and veſſels going to the hollow of the *os calcis*, like a ſheath.

5. The *Vaginal Ligament of the extenſor*

muſcle of the great toe. It ſurrounds the tendon of this muſcle like a ſheath.

6. The *Vaginal Ligament of the proper flexor muſcle of the great toe.* It includes, like a ſheath, the tendon of this muſcle, in the hollow of the *os calcaneum:* it is inſerted into the inferior and lateral ſurface of this bone.

7. The *Vaginal Ligaments of the flexor tendons.* This name is given to the ligaments which reſemble ſheaths, and include the tendons of the *flexor* muſcles, on the inferior or concave ſurface of the phalanxes.

8. The *Acceſſory Ligaments of the flexor tendons.* Theſe are ſhort but ſtrong, ariſing, as in the fingers, from the phalanxes of the toes, and being included by the ſheath of the tendons, is loſt in them.

9. The *Tranſverſe Ligaments of the extenſor tendons.* By this name, ſmall ligaments are called, which go from one tendon of theſe muſcles to another, retaining them in the natural ſeat.

MYOLOGY.

Of the Muſcles in general.

A MUSCLE is that fleſhy part of a human body, by which ſenſible motion is performed.

Muſcles are compoſed of fibres, of two kinds: the one, which are red, ſoft, irritable and ſenſible, called *Fleſhy Fibres*; the other, which are ſmaller, firmer, ſtronger, and of a white and ſilver-like colour. Theſe latter fibres, when collected into a ſmaller and round bundle, come under the name of *Tendons*; when expanded upon a wide ſuperficies, they are called *Aponeurotic Expanſions* (148).

Every muſcle is divided into three parts; its middle or belly, which always conſiſts of fleſhy fibres, its beginning and its end. The beginning and end of a muſcle are generally tendinous; and the former is called a *fixed point*; the latter a *moveable point*, or ſimply, a *tendon* (149).

Muſcles

(148) A Tendon is already deſcribed (Note 146.). Perhaps there is no unequivocal ſign of muſcularity, except voluntary motion. "*Fibrum rubrorum faſciculi*," (Haller, *Prim. Lin. Phyſ.* § 394.) is a bad definition: for the ultimate fibres of muſcles are not red, but white (Note 152.).

(149) The *Origin* of a muſcle is that part which ariſes neareſt to the trunk of the body, and which ariſes from

 the

Mufcles acquire various names, from their fize, figure, fituation, direction, compofition, ufe, and from the parts to which they are attached; hence, they are called, *Great*, *Middle*, *Small*, *Broad*, *Triangular*, *Round*, *Pectoral*, *Brachial*, *Oblique*, *Tranfverfe*, *Tricipites*, *Biventres*, *Pronatores*, *Flexores*, *Cleidomaftoid*, *Coracoid*, &c.

There are found in all mufcles, foft, long, flender fibres, collected into bundles by the vaft mafs of cellular texture which furrounds them. Thefe little bundles are joined together, fo as to make larger bundles, by means of the fame cellular membrane, partly filled with fat. Thefe bundles are feparated from one another by membranous partitions, till many fimilar bundles, covered with cellular membrane, conftitute a *mufcle*. The membrane, which covers mufcles, and is fimple, fmooth, fat, and produced of cellular texture, is called the *cellular coat of a mufcle* (150): but the cellular texture, which enclofes tendons,

the moft ftable part, towards which the contraction is made. The origin of a mufcle is alfo called its *Head*, and its *Centre of Motion* (Douglas, *Myog. Comp.* Introd.).

The *Infertion* of a mufcle is more remote from the trunk of the body; it is fmaller; it is implanted into the part to be moved. It is alfo called the *Tail*, or *End of a mufcle*, or fimply, its tendon.

The *Belly*, or *Middle* of a mufcle, is that part which fwells when a mufcle acts; it lies between the Origin and Infertion (Winflow, *Exp. Anat.*).

(150) The *cellular coat of a mufcle*, was called by the ancients *membrana mufculorum communis*. The covering however of mufcles, and mufcular fibres, is nothing but cellular membrane (Morgagni, *Adv. Anat.* II. *Animad.* VI. *p.* 17.).

and

and is very like the cellular coat of mufcles, is called their *fheath*.

The fibres, of which mufcles are compofed, are longitudinal, femicircular, oblique or tranfverfe. If they all go in the fame direction, the mufcle is called *fimple*; but if they go in various directions, in the fame mufcles, then it is called *compound* ([151]). Moreover, all the large mufcles, which are formed of lefs, are in general compound mufcles.

All mufcles have *nerves* diftributed throughout their flefhy fibres; they have *arteries* and *veins* likewife propagated plenteoufly among their fibres, through the cellular coat abovementioned, where they difappear in the form of a moft delicate network, and impart the red colour to mufcles. The Tendons of mufcles have only lymphatic veffels ([152]).

The

([151]) Befides the *fimple*, or *rectilinear* mufcle, there is the *radiated* mufcle, in which the fibres go like rays. A mufcle is called *penniform*, when its fibres are difpofed like the plume of a feather; *compound penniform*, when two fimple penniform mufcles are contiguous.

Mufcles that concur in producing the fame action, are called *congeneres*: but thofe that act contrary to each other are called *antagoniftae*, or *extenfores* and *flexores*. If there were not *flexores* as well as *extenfores*, the limbs muft always remain extended.

([152]) The rednefs of a mufcle depends on the blood-veffels in its cellular membrane. The mufcular fibres of the arteries, and of the ftomach and inteftines, and of other parts are naturally pale; and the reddeft mufcle becomes pale alfo when wafhed, and freed from its red blood.

The arteries, veins, lymphatics, and nerves of mufcles run contiguous to one another.

How

The *Uſe* of muſcles is, to perform the motions of the body. But the motion of moſt muſcles is under the influence of the mind; though the motion of ſome depends on a power inherent in them: for example, the Heart, the Inteſtines, &c. ([153]).

Muſcles

How came Leber to aver "*Tendines vero vaſis ſolum* "*gaudent lymphaticis?*" Perhaps he only meant to ſay that red blood is not circulated through them.

(153) All the motions of a human body are not performed by muſcles; for there are ſome parts, not muſcular, that ſeem to be moved only in conſequence of the force of the blood propelled into them. Such are the *corpora cavernoſa* of man, and the *clitoris* and nipple of woman.

The form of the body, and the elegance of gait, depend on muſcles. It is by muſcles that we expreſs our thoughts and ſenſations.

All that is known of the fabric of muſcles is already mentioned. Whether muſcles be continuations of nerves, or not, is a queſtion of eaſy ſolution. 1. Muſcles are ſtrong and tough: nerves are pulpy and ſoft. 2. Muſcles contract, when ſtimulated: nerves are not contractible. 3. Is it rational to imagine that a large muſcle can be formed of a ſmall nerve; the fibres of which run parallel to one another, and do not divide like the blood-veſſels? 4. Dividing the ſpinal marrow, or ſciatic nerves of a frog produced no ſenſible alteration in the muſcles of the thigh and leg of a frog more than a year afterwards. Now, certainly if muſcles aroſe from the extremities of nerves, ſuch a diviſion ſhould have cauſed them to ſhrink (Obſ. on the Struct. and Func. of the nervous ſyſtem, &c. by Alex. Monro, M. D. &c.).

The actions of the human body are commonly diſtinguiſhed into *vital, natural* and *animal*; the firſt comprehending the motion of the lungs, and heart and arteries; the ſecond comprehending digeſtion, chylification, nutrition, ſecretion, &c. and the laſt comprehending all the ſenſes, and voluntary motions. But this diſtinction is certainly uſeleſs; for all the motions of animals are equally intitled to the name of *natural motions*: all of them are

Muſcles of the Head.

The Muſcles of the head are ſituated either immediately under the common integuments; or

are effects of life, and are equally *vital*, and equally *animal*.

A better diviſion of animal motions is perhaps into *voluntary* and *involuntary:* the former comprehending ſuch as proceed from an immediate exertion of the active powers of the will; and the latter comprehending ſuch as are performed by the organs, ſeemingly of their own accord, without any attention of the mind, or conſciouſneſs of its active power.

The involuntary motions of animals are, ſome of them under the controul of the will; at leaſt, though not ordinarily directed by it, yet they are ſubject to it. For example, the intercoſtal muſcles, the abdominal muſcles, and the diaphragm, which ordinarily act, without our being conſcious of their acting; but which may be prevented from acting at all, as often as we pleaſe. Dr. Whytt calls theſe *Mixed Motions*; and comprehends both them, and thoſe that are performed, at all times, without any attention of the mind, under the general denomination of *Spontaneous Motions*.

When a muſcle acts, it becomes ſhorter and thicker; both its *origin* and *inſertion* are drawn towards its *middle*. The *ſphincter* muſcles are always in action; and ſo likewiſe are *antagoniſt* muſcles, even when they ſeem at reſt. When two *antagoniſt* muſcles move with equal force, the part which they are deſigned to move, remains at reſt; but if one of the *antagoniſt* muſcles remains at reſt, while the other acts, the part is moved towards the *centre of motion* of the muſcle. All this is evident in the diſeaſes called *Tetanus* and *Opiſthotonos* and *Emproſthotonos*. All the muſcles of live animals are conſtantly endeavouring to ſhorten themſelves.

When a muſcle is divided, it contracts. If a muſcle be ſtretched to a certain extent, it contracts and endeavours to acquire its former dimenſions, as ſoon as the ſtretching cauſe is removed. This takes place in the dead body;

or are to be referred to the eyes, ears, nose, mouth, lips, lower jaw, *os hyoides*, tongue, pharynx,

body; it takes place in muscles cut out of the body; it takes pace in parts that are not muscular. This power is called by Haller *Vis Mortua (Prim. Lin. Phys.* § 400.): others have called it *Vis Elastica.* It is greater in living than in dead bodies, and is called *Tone.*

When a muscle is wounded, touched, or otherwise irritated, it contracts, independent of the will of the animal that is the subject of the experiment, and without its feeling pain. This property of a muscle is called by Haller *Vis Insita.* It is a power peculiar to, and inherent in the muscles; according to Haller, exclusively of the nerves (Weber, *Comment. de initiis ac progressibus doctrinae irritabilitatis. Halae*, 1783.).

Another power of the mucles is that by which they act, when excited by the nerves. Whytt called it *Vis Nervosa*, or the *power* or *influence of the nerves.* Finding that the *vis insita* of Haller is excited and destroyed by the same means as the *vis nervosa*; finding that by destroying the nerve going to a muscle, the irritability, or *vis insita*, of the muscle perishes, he concluded that the irritability depends upon the sensibility, and reasoned somewhat after this manner:—when a *stimulus* is applied to a muscle, it excites an ungrateful sensation in it, which sensation is carried by the nerves to the mind: the mind, using the same messengers, sends back its mandates to the muscle, which by contracting endeavours to rid itself of the *stimulus.*

Now to me, this doctrine of the celebrated Whytt seems extremely erroneous; for it supposes that there is sensation, without the consciousness of the mind; it supposes sensation in a muscle, when separated from the rest of the body.—The disciples of Whytt endeavour to account for the contraction, which remains in parts when separated from the body, by assigning it to the *vis nervosa* still abiding in them, and keeping them alive; but granting the truth of this, it militates not against the *vis insita* of Haller.

Haller never denied that the nerves going to muscles are capable of exciting those muscles, whether detached

pharynx, soft palate, and the top of the *aspera arteria*; or lastly, they are intended for the motion of the head itself.

Of

from the body, or not. Haller every where allows that irritability and sensibility are increased and diminished by the same powers. But parts that are irritable are not consequently sensible; for the heart is not sensible, though it is extremely irritable; and the intestines are less sensible than the stomach, but far more irritable.

Again, the nerves going to the heart are derived from the intercostal nerve and the *par vagum*: and if these be divided, or tied, on both sides, the animal does not immediately die, neither did the heart cease to contract in seven or eight minutes afterwards (Marherr, *in* Boerh. § 189.). Even Whytt allows that motion may be excited in paralytic limbs by electricity (Physiol. Essays.).

Animals, as the *polypus*, and plants, in which no nerves have been discovered, are extremely irritable (Haller, *Elem. Phys. Sect.* 2. *Ap. T.* IV.)

Lastly, Haller never denied that the contraction of a muscle is greater, when the *stimulus* is applied to the nerve going into that muscle. For, it is plain, that as the nerve is disseminated throughout the muscle; and, as the internal parts are frequently more irritable than the external, it is plain, I say, that more contraction shall ensue by exciting a muscle by the *vis nervosa*, than by exciting it by other means.

Albinus remarks—" *experimenta indicant, integritatem nervi requiri, ut aptus sit musculus qui secundum naturam se moveat: ostendunt, nervo stimulato fibras carneas in convulsiones agi. An vero ostendunt, nervorum potestate moveri? Excusatam velim incredulitatem meam* (*Annot. Acad. Lib.* I. *Cap* XII. *p.* 49.).

Professor Blumenbach, in his Physiological Institutes, enumerates five vital powers; the three following of which he calls *common*: viz. 1. *Contractility*, which is a property of the cellular membrane, and may be named *Vis cellulosa*. 2. *Irritabilitas*, which is as Haller describes it, and from its being a property of muscles, he names *Vis musculosa*. 3. *Sensibility*, which is a property of the nerves by which they communicate impressions to the brain, he names

Vis

Of the Muſcles of the Cranium.

Theſe are the two *Frontales* Muſcles, and the two *Occipitales*. Some authors deſcribe them

Vis nervea. A fourth power, he calls *Vita propria*, comprehending under it thoſe powers which cannot be referred to either of the former three claſſes of common powers; as the powers of the *Viſcera*, which have ſuch ſingular motions that they cannot be derived from either of the former claſſes, but muſt be referred to ſome *Vita propria*. His examples are taken from the motions of the *Iris*. the erection of the *Papilla*, the motion of the *Fimbriae* of the Fallopian tubes, the action of the *Placenta*, and of the *Uterus* in time of labour, the deſcent of the teſticles, and perhaps ſecretion. The fifth, and laſt power, he calls *Niſus formativus*: which, he ſays, is the efficient cauſe of the whole buſineſs of generation (taken in the moſt extenſive ſenſe, and comprehending both nutrition and reproduction as its modifications). It ought to be conſidered, he ſays, as that which cauſes the genital or nutritious matter received in the proper place, and brought to maturity, to take on its deſtined form, and to paſs into thoſe parts, which are endowed with the common vital powers and *Vita propria* (*Inſt. Phyſ. Sect*. IV.).

Speaking of the diſtinction of motion into voluntary and involuntary, Profeſſor Blumenbach ſays, it is encumbered with many difficulties, ſo that it is hardly poſſible to determine the limits of each. He thinks the only involuntary motions are the ſpaſms of the *Uterus* during labour. For he refers to the caſe told by Cheyne, in his *Treatiſe on Nervous Diſeaſes*, in which the beating of the heart was under the controul of the will: he ſays, the motion of the ſtomach is voluntary, as rumination ſhows in general, and as he ſays in a ruminating man: he ſays he is credibly informed of a man who could contract his iris in a dark place, and leſſen his pupil, as often as he choſe; and he ſays he knew men who could at pleaſure bring on a contraction of the ſkin like that occaſioned by the idea of certain ungrateful ſenſations (*Sect*. XXIII.).

Whether

them both under the common name of *Musculus Epicranius*, or *Digastricus Cranii*, because they are connected to each other by an aponeurotic expansion; but we shall consider the *Frontales* and the *Occipitales* separately ([154]).

The *Frontales* are two thin muscles, one of which arises by a fleshy beginning on each side, near the middle of the orbital margin, from its interior part. They are united to each other, at

Whether a muscle be *stimulated* through the *medium* of the nerves by the will, or by any foreign body applied directly to it, or by its being stretched beyond its usual length, or otherwise; it contracts, and its contraction is greater or less, in proportion as the *stimulus* applied is greater or less.

The contraction of muscles is different according to the purpose to be served by their contraction. Thus, the heart contracts with a jerk; but the urinary bladder contracts slowly and uniformly. Puncture a muscle, and its fibres vibrate. The abdominal muscles act slowly in expelling the contents of the *rectum*, but violently in vomiting.

Relaxation generally succeeds the contraction of muscles, and alternates with it, even though the *stimulus* be continually applied. And the alternate contractions and relaxations of muscles continue frequently a long time, after the *stimulus* that first excited them is removed. But muscles obedient to the will continue contracted or relaxed as long as the will continues to determine the influence of the nerves into their fibres.

Some muscles continue in a state of contraction as long as the *stimulus* continues to act. Such are the orbicular muscle of the *uvea* and the muscles of the internal ear.

These are the chief of the *phoenomena* of muscles. Their causes are beyond the sphere of our comprehension.

([154]) Cowper and Albinus were among those who accounted the *frontales* and *occipitales* as one muscle. Cowper called them *Digastricus* (*Myot. in fol.* p. 16.); and Al-

at their origin, and with the muſcles of the eye-brows, the *orbiculares palpebrarum*, and thoſe of the noſe, by means of ſome fibres. Hence they aſcend obliquely outwards to the coronal future, where they become, for the moſt part, tendinous. They adhere firmly to the membrane ſtretched over the *oſſa ſyncipitis*, and to the tendinous expanſion of the *Occipitales* muſcles; conſtituting with the latter what is called *Galericulum Aponeuroticum* ([155]).

The *Occipitales* Muſcles have their name from the bone they cover. They ariſe on each ſide from the external ſpine of the *os occipitis*, and paſs tranſverſely towards the maſtoid proceſs. They are thin and tendinous at their beginning, and aſcend obliquely. Their extent is nearly equal to the breadth of two fingers. They are terminated in a broad aponeurotic expanſion, uniting with the broad tendon of the frontal muſcles, and forming the *Galericulum Aponeuroticum* before-mentioned, which adheres very firmly to the ſkin, but very laxly to the *pericranium*: ſo that the ſkin is eaſily moved with the *galericulum*. It is extended on both ſides to the neck, and covers the muſcles placed there ([156]).

The

Albinus *Epicranius (Hiſtoria Muſc.)*. Douglas deſcribed both *Occipitales* and *Frontales* muſcles, under the name of *Occipito-frontalis (Myol. Comp.)*: and ſo alſo did Innis (A Short Deſcription of the Human Muſcles, &c.). But Leber has followed the example of Heiſter *(Comp. Anat.)*.

([155]) The Antagoniſts of the *Frontales* Muſcles, according to Heiſter, are the *Orbiculares Palpebrarum (Comp. Anat.)*: but, according to Douglas, the *Corrugator* is the antagoniſt of the *occipito-frontalis*.

([156]) Theſe occipital muſcles, according to Morgagni, are

The *Use* of these four muscles is, to wrinkle the forehead, also to smoothen it; to elevate the eye-brows, and to draw the skin reciprocally backwards and forwards.

Of the Muscl s of the Eye-Brows.

The *M. Corrugator Superciliorum* is situated behind the inferior part of the frontal muscle. It arises near the connection of the *os frontis* and *os nasi*; then sends off fibres upwards and outwards in the direction of the orbital arch; and is lost in the adjacent muscles, and common integuments of the eye lids ([157]).

Its *Use*. With the corresponding muscle, it brings the eye brows nearer together, and contracts the skin within the eye brows into longitudinal folds.

Of the Muscles of the Eye Lids.

There belong to each *Eye Lid* three muscles, viz.

1. The *Orbicularis Palpebrarum.*
2. The *Levator Palpebrae Superioris.*
3. The *Depressor Palpebrae Inferioris.*

are sometimes wanting; and are sometimes so thin as to be scarcely distinguishable. Sometimes, however, they are large, and appear as if divided into two: hence Santorinus accounted the occipital muscle of each side double *(Obs. Anat. p.* 8 & 9.).

([157]) Volcherus Coiter was, I believe, the first who described this muscle: hence it is called by Douglas, and others, *Corrugator Coiteri*, or *Musculus Frontalis Verus*. To Cowper and Heister, this muscle seemed to be only an oblique elongation of the *frontales* muscles; but to Santorinus it seemed as a part of the *orbicularis*.

The *Orbicularis Palpebrarum* is thin and broad. Its fibres, which are fleſhy, adhere to the whole circumference of the orbit; but become thinner, and broader near the zygomatic arch. They are thicker in the ſuperior eye lid, and more compacted together; and are, laſtly, interwoven with the fibres of the frontal muſcle. Moreover the fibres of this muſcle are decuſſated in the internal and external *canthus*, and ſend a ſmall tendon into the internal angle of the eye, which is connected to the naſal proceſs of the upper jaw ([158]).

Its *Uſe*. It ſhuts the eye lids; and hence it is that ſome call it the *Sphincter Oculi*.

The *Levator Palpebrae Superioris* is the thinneſt of all. It begins by a ſmall tendon in the bottom of the orbit, near the optic *foramen*, and paſſes forwards: it becomes broader in its courſe, and adheres by means of a broader tendon to the cartilage of the upper eye lid ([159]).

Its

([158]) The *Ciliaris* muſcle deſcribed by Riolan (p. 308.) is nothing more than the thicker part of this muſcle, covering the *cilia*, or *tarſi*.

The tendon of this muſcle may be felt in the internal *canthus*. It lies over the lacrymal ſac: and it is divided in the operation for *fiſtula lacrymalis*. A ſmall fleſhy bundle of fibres running down from the outer and inferior part of this muſcle, over the *zygomaticus minor* to the *Levator Labii ſuperioris* and *Alae Naſi*, is mentioned by Douglas and Innis.

([159]) *Aperiens palpebram rectus*, of Fallopius (*Obſ. Anat. p.* 61.), and Douglas. The action of this muſcle was formerly aſſigned to the *Orbicularis Palpebrarum*: but when Fallopius had learnt from Oribaſius that the *os unguis* frequently exfoliates in *fiſtula lacrymalis*, and that the eye could, nevertheleſs, be opened at pleaſure; he ſought

Its name is expreſſive of its *Uſe*.

The *Depreſſor Palpebrae Inferioris* ariſes ſometimes from the *os zygomaticum*, but oftener from the fibres of the *platyſma myoides*, which aſcend over the cheeks. It aſcends obliquely, and is connected to the *tarſus* of the under eye lid.

Its *Uſe* is evident from its name.

Of the Muſcles of the Ball of the Eye.

Six muſcles are deſtined for the motion of the ball of the eye; two of which are called *Obliqui*, and the other four *Recti*.

1. *Obliquus Superior*, or *Magnus*.
2. *Obliquus Inferior*, or *Parvus*.
3. *Rectus Superior*.
4. *Rectus Inferior*.
5. *Rectus Internus*.
6. *Rectus Externus*.

1. The *Obliquus Superior*, or *Magnus*, or *Trochlearis*, ariſes by a ſmall tendon, near the internal optic *foramen*, between the *rectus ſuperior* and *internus*; from thence it paſſes forwards, and goes by a very ſmall, long tendon through the *trochlea*, formed of a canal in the orbitar proceſs of the *os frontis*, at the inner angle of the orbit, and a cartilage that is hollowed in the middle. It is faſtened in this place by means of a double ligament; and being come out of the *trochlea*, it is bent backwards, and inſerted into the poſterior ſur-

ſought after the cauſe of it, and found and deſcribed this muſcle (Douglas, Deſcrip. of the Muſcles. *Verſio Latina, cum notis Joan. Fred. Schreiber.*).

face of the ball of the eye, near the *rectus externus* muſcle.

Its *Uſe*. It draws the ball of the eye downwards and inwards.

2. The *Obliquus Inferior*, or *Parvus*, ariſes in a ſmall depreſſion, ſituated in the naſal proceſs of the ſuperior maxillary bone, towards the margin of the orbit, near the orifice of the lacrymal duct: from thence it paſſes round the ball of the eye, and is inſerted into it, by means of its broader tendon on the poſterior and lateral part, behind the *rectus externus*.

Its *Uſe*. It moves the eye-ball inwards and downwards at the ſame time.

The *Recti* Muſcles of the ball of the eye have gotten names, not only from their ſituation, but from their uſe alſo: as

1. *Rectus Superior*, or *Attollens*, or *Superbus* ([160]).

2. ——— *Inferior*, or *Deprimens*, or *Humilis*.

3. ——— *Internus*, or *Adducens bulbum*, or *Bibitorius*.

([160]) Between this muſcle and the *Levator Palpebræ ſuperioris*, there is a quantity of adipoſe membrane.

Mr. Hunter properly obſerves, that—" for diſtinct viſion, the object muſt be fixed reſpecting the pupil of the eye, and not in the leaſt allowed to move over its ſurface. To prevent any progreſſive motion of the object over the retina of the eye, either from the motion of the object itſelf, or of the head in ſome of the motions of that part, the ſtraight muſcles *(Recti)* are provided, as has been explained; but the effects which would ariſe from ſome other motion of the head, as from ſhoulder to ſhoulder, cannot be corrected by the action of the ſtraight muſcles, therefore the oblique muſcles *(Obliqui)* are provided (Obſ. on Certain Parts of the Animal Oeconomy. p. 209.)."

4. *Rectus Externus*, or *Abducens bulbum*, or *Indignatorius*.

The Four Muſcles now mentioned, ariſe by ſmall tendons near the *foramen opticum*, from the *periorbit*, or *perioſteum* covering the orbit; paſs thence fleſhy, in a ſtraight direction, and are inſerted into the *tunica ſclerotica* of the eye, by the intervention of broad tendons.

Their *Uſe* is manifeſt from their deſcription.

The Muſcles of the Ear.

The Muſcles of the Ear are diſtinguiſhed into *External* and *Internal*: the *External* are again divided into two claſſes.

The three referred to the external ear, are connected with contiguous parts: viz.

1. The *Superior* and *External Auricular*.
2. The *Anterior* and *External Auricular*.
3. The *Poſterior* and *External Auricular*.

The Five others, which though ſmall are always preſent, belong to the cartilages of the ear: viz.

1. The *Tragicus*.
2. The *Antitragicus*.
3. The *Tranſverſus Auriculae*.
4. The *Major Helicis*.
5. The *Minor Helicis*.

The *Muſcles of the Internal Ear* are four in number, and thoſe are very ſmall: viz.

1. The *Muſculus Mallei Externus*,
2. The *Laxator Tympani*,
3. The *Tenſor Tympani*,
4. The *Stapedius*.

Of the Muſcles of the External Ear.

1. The *Superior External Auricular*, or *Attollens*, is compoſed of very ſmall fleſhy fibres, which ariſe from the aponeurotic expanſion of the frontal muſcles, and of the occipital muſcles near the temporal region. Theſe fibres afterwards paſs over the aponeurotic expanſion of the temporal muſcle, and are inſerted into the *helix*, partly externally and partly internally, near the opening of the ear, by means of a tendon ([161]).

Its *Uſe* is evident from its name.

2. The *Anterior External Auricular*, which is leſs than the reſt, ariſes at the baſe of the zygomatic proceſs from the tendinous membrane of the temporal muſcle, it runs almoſt tranſverſely backwards, and adheres to a part contiguous to the *concha* at the beginning of the external *helix*.

As to its *Uſe*, it ſeems to ſtiffen this part of the *concha*.

3. The *Poſterior External Auricular*, or *Retrahens*, is ſituated almoſt tranſverſely. It

([161]) The number of the external muſcles of the ear is uncertain. The antients made no mention of them at all; and Fallopius, who firſt deſcribed them and enumerated three, confeſſed that they are not always preſent (*Obſ. Anat.*). Du Verney deſcribed only two muſcles of the external ear (*Tract. de Auditu.*). Valſalva deſcribed one *ſuperior* muſcle, three *poſteriores*, and one *anterior* detected by himſelf (*De Aure Hum. Tract. Cap.* I. § 6.). If one may confide in Heiſter, the number of theſe muſcles is different in almoſt every ſubject (*Comp. Anat.*).

is often double, and ſtronger than the two preceding. It ariſes from the aponeurotic expanſion of the cervical muſcles at the maſtoid apophyſes of the *oſſa temporum*, paſſes tranſverſely forwards, and is fixed in the convex part of the *concha*.

Its *Uſe* is to draw back the *concha*.

Of the Muſcles of the Cartilages of the Ear.

1. The *Tragicus*, which is ſmall, and almoſt ſquare, ariſes from the margin of the *tragus*, and terminates in the *tragus* anteriorly and externally.

The *Uſe of the Tragicus* muſcle is to ſtiffen the *tragus*, and perhaps to dilate, in ſome degree, the opening of the ear ([162]).

2. The *Antitragicus*, which ariſes from the root of the interior *helix*, and is inſerted inferiorly at the top of the *antitragus*.

Its *Uſe* is to dilate the mouth of the *concha*.

3. The *Tranſverſus auriculae*; it ariſes from the upper part of the *concha*, runs tranſverſely backwards, and is fixed to the interior *helix*.

4. The *Major Helicis exterioris*; this muſcle is narrow, and oblong; it ariſes from the

([162]) Marherr ſays the *tragicus* muſcle is hardly able to dilate the *concha* (*Prael. in Boerh. Inſt. Med.* § 55[illegible]); and Heiſter ſays that the muſcles aſcribed by Valſalva to the *tragus* and *antitragus*, and by Santorinus and Douglas to the *helix*, *concha*, and *meatus auditorius*, are, in his opinion, only muſcular membranes, and not true muſcles, becauſe they have ſeldom any fleſhy fibres, or perform any manifeſt motion (*Comp. Anat.*).

fore part of the acute cartilaginous procefs of the exterior *helix*, afcends in the courfe of this *helix*, and is implanted in it (163).

5. The *Minor Helicis exterioris*; it arifes from the bottom of the exterior *helix*, afcends externally according to the flexure of this *helix*, and is inferted into its margin (164).

Their *Ufe*. The mufcles now mentioned, feem to ftretch the two cartilages of the ear, that founds, fcarcely audible, may be perceived the more diftinctly.

The Mufcles of the Internal Ear.

1. The *Externus Mallei*; it arifes from the fpinous procefs of the *os fphoenoides* projecting between the fquammous and petrous proceffes of the temporal bone; it paffes through a fmall fiffure of the articular cavity of the temporal bone, and is connected to the longeft procefs of the *malleus*. Many doubt, whether it be a real mufcle, becaufe it cannot be diftinguifhed from the red fpongy membrane (165).

2. *Laxator Tympani*; this is a very fmall, thin mufcle, arifing fuperiorly from the edge

(163) The *Major Helicis* mufcle is often wanting (Albinus, *Annot. cad. L.* VI. *Tab.* IV.).

(164) The *Minor Helicis* mufcle, though defcribed by Albinus, Haller, and a few others, has not been feen by many eminent anatomifts (Marherr.).

(165) Albinus and Du Verney, call it alfo *Externus Mallei*. Innis enumerates only three mufcles of the internal ear, and gives the name of *Laxator Tympani* to this, comprehending under it both the *Externus Mallei* and the *Laxator Tympani* of Leber and other anatomifts.

of the *membrana tympani*, at the end of the *meatus auditorius externus*, where the *membrana tympani* is fixed. It ends by a very ſmall tendon at the *manubrium mallei* near its ſmaller proceſs.

Its *Uſe* is, to draw the *manubrium mallei* backwards and outwards; and, of conſequence, to relax the *membrana tympani* after its being ſtretched. It is doubted by ſome celebrated anatomiſts whether this be a real muſcle, or not.

3. The *Tenſor Tympani* adheres, by means of a very ſmall tendon, to a proceſs of the *os ſphoenoides* between the canal of the internal carotid, and the orifice for the artery of the *dura mater*: it runs in its proper furrow in the Euſtachian tube, and is there covered by a membranous ſheath, which together with the furrow forms an entire canal. It then becomes gradually ſmaller; and is connected, at the end of the canal, to the beginning of the *manubrium mallei*, which is turned downwards and outwards (166).

Its *Uſe*. When this muſcle acts, it draws the *manubrium mallei*, and with it the *membrana tympani* inwards, and conſequently ſtretches it.

4. The *M. Stapedius* is ſmall, and incloſed in a cartilaginous cone. From this muſcle

(166) The *Tenſor Tympani* is the *Internus Auris* of Douglas.

there

there goes a tendon forwards, to unite with the head of the *ſtapes* under the *incus* ([167]).

The Muſcles of the Noſe.

To the Noſe three pair of muſcles are proper; three muſcles being on each ſide: viz.

1. The *Levator Alae Naſi, Labiique ſuperioris*;

2. The *Conſtrictor*, or *Compreſſor Naſi*;

3. The *Depreſſor Alae Naſi*;

And ſome refer to theſe,

4. The *Naſalis Labii ſuperioris.*

1. The *Levator Alae Naſi, Labiique ſuperioris* ariſes, by a double tendon, from the naſal proceſs of the ſuperior maxillary bone: it deſcends on the ſides of the noſe, and is inſerted by its interior part into the *pinnae*, and by its exterior into the upper lip and *ſphincter oris.*

Its *Uſe*. It dilates the noſtrils, and raiſes the upper lip ([168]).

([167]) *Stapidaeus* of Douglas. When this muſcle acts, it elevates the *ſtapes*.

([168]) Douglas called this muſcle *Elevator Labii ſuperioris proprius*. Winſlow called that part which ariſes from the external orbitar proceſs of the maxillary bone, *Inciſivus lateralis*. It is this portion that draws the upper lip upwards and outwards. The portion, that ariſes from the naſal proceſs, at the *inner canthus*, Winſlow called *Pyramidalis* (*Exp. Anat.*). But ſee the *Levator proprius Labii ſuperioris*, among the muſcles of the mouth and lips.

2. The

2. The *Constrictor*, or *Compressor Nasi*, is a small muscle arising, by a narrow beginning, from an eminence of the superior maxillary bone: it runs, and grows broader as it spreads over the sides of the nose. It unites, in part, with its fellow on the opposite side, and, in part, vanishes in the *pinnae*.

Its *Use*. When this pair of muscles act, the *pinnae* are pressed towards the *septum*, so that the nostrils are lessened (169).

3. The *Depressor Alae Nasi* arises from the superior maxillary bone, and the *alveoli* of the superior *incisores*, and canine teeth: it descends and grows broad, and is implanted in the *septum* and lowest part of the *pinnae narium*.

Its *Use* is, to draw the nose downwards, and to stiffen it in some degree (170).

4. The *Nasalis Labii superioris* is described among the muscles of the mouth and lips.

Its *Use* is to draw the tip, and *septum narium* downwards.

The Muscles of the Mouth and Lips.

To the Lips we assign twelve muscles, of which the eighth and eleventh are simple, all the rest are double.

1. The *Levator Labii superioris, Alaeque Nasi.*

(169) Douglas called it *Rinaeus*, or *Nasalis*.

(170) It is the *Depressor Labii superioris proprius* of Douglas; the *Incisivus medius* of Winslow, and the *Depressor Labii superioris Alaeque Nasi* of Innis. San.

2. The

2. The *Levator Labii ſuperioris proprius.*
3. —— ——— *Anguli Oris.*
4. The *Zygomaticus major.*
5. The ——— *minor.*
6. The *Buccinator.*
7. The *Naſalis Labii ſuperioris.*
8. The *Orbicularis Labiorum.*
9. The *Depreſſor Anguli Oris*, or *Triangularis.*
10. The ——— *Labii inferioris*, or *Quadratus.*
11. The *Levator Menti.*
12. The *Latiſſimus Colli*, or *Platyſma-myoides.*

1. The *Levator Labii ſuperioris, Alaeque Naſi* is deſcribed among the muſcles of the noſe.

Its *Uſe* is evident from its name.

2. The *Levator proprius Labii ſuperioris*, or *Inciſivus* ariſes, by a very ſmall tendon, from the ſuperior maxillary bone, at the infra-orbital margin: its fleſhy fibres run upwards and obliquely inwards to the lip, and are there mixed with the fibres of the *orbicularis Labiorum.*

3. The *Levator Anguli Oris*, or *Caninus*, compoſed of ſlender fibres, ariſes from the upper jaw, by a very ſhort but double tendon, immediately below the *foramen orbitale anterius:* it paſſes from thence downwards to the angle of the mouth, and is finally inſerted into the *orbicularis labiorum* (171).

(171) Douglas calls it *Elevator Labiorum communis:* Winſlow *Caninus.*

 The

The *Use* of this muſcle, as well as of the preceding, is evident from their denominations.

4. The *Zygomaticus major* is long and ſmall; it ariſes from that part of the Zygomatic bone which is connected with the Zygomatic proceſs of the temporal bone. The fibres of this muſcle, collected, as it were, into a bundle, deſcend obliquely inwards, and are croſſed by the fibres of the *elevator anguli oris*, and *ſphincter labiorum*, in which they diſappear.

Its *Uſe*. When this muſcle and its fellow, on the oppoſite ſide, act at the ſame time, the angles of the mouth are drawn from each other. When only one acts, the angle of the mouth, and the cheek are drawn laterally upwards ([172]).

5. The *Zygomaticus minor*, if it be preſent, (for it is often wanting,) is the ſmalleſt muſcle of the mouth and lips: it ariſes directly under the former, and is turned rather more inwards: it deſcends and ends in the *ſphincter labiorum*.

Its *Uſe* is the ſame as that of the former.

6. The *Buccinator* ariſes from the *alveoli* of the ſuperior *molares*, and deſcends to the *alveoli* of the inferior *molares*. The fleſhy fibres of this muſcle are joined together, and anteriorly with the *ſphincter labiorum* in the angle of the mouth.

([172]) This muſcle, in its oblique deſcent, is often divided into two (Euſtac. *Tab.* XXIX. XXXV.). It acts both in laughing and crying.

Its *Uſe.* In chewing, it puſhes the food between the teeth; in blowing muſical inſtruments, it both retains and expels wind, according to the will of the muſician. Moreover, it may be obſerved concerning this muſcle, that it is perforated in its middle by the ſalival duct of Steno ([173]).

The *Naſalis Labii ſuperioris* is compoſed of a few fleſhy fibres ariſing from the tip of the noſe; and the *ſeptum* contiguous to it, deſcending to the upper lip, running outwards to the angle of the mouth, and diſappearing in the *ſphincter labiorum* ([174]).

Its *Uſe.* When it acts, it either draws the *ſeptum narium* and apex of the noſe downwards, or it contracts the angles of the mouth, and corrugates the upper lip.

8. The *Orbicularis Labiorum*, or *Sphincter Oris*, is broad and ſufficiently thick, eſpecially at the angles of the lips: it meaſures the whole circumference of the mouth, in ſuch a manner that the fibres of the upper lip are mixed with thoſe of the under, in the angles of the mouth. For this reaſon it is, that this muſcle is divided into the *ſuperior* and *inferior* by ſome authors, each being of a ſemicircular figure. It is fixed to no bone, but

([173]) When this muſcle acts it enlarges the parotid gland.

([174]) This muſcle, which is deſcribed by Albinus, is ſaid by Innis to be only ſome fibres of the *orbicularis oris* connected to the *ſeptum narium* (Deſcrip. of the *Orbicularis oris.*).

is

is ſtrengthened by the fibres of neighbouring muſcles running into it (175).

Its *Uſe* is to contract the mouth and corrugate the lips.

9. The *Depreſſor Anguli Oris* is ſmall and triangular, and hence it is called by ſome *Triangularis Labiorum.* It ariſes by a fleſhy beginning from the margin of the lower jaw, its fibres being rather expanded on the ſide of the chin; but they are contracted, as they aſcend, into a narrow bundle, and are interſected by the fibres of the *ſphincter labiorum* at the angle of the mouth (176).

10. The *Depreſſor Labii inferioris* is a ſmall muſcle of the ſame breadth from beginning to end: hence, from its having four corners, it was called by ſome authors *Quadratus menti.* It ariſes from the chin, and is inſerted into

(175) Douglas called it *Sphincter Labiorum.* Winſlow is among the authors referred to by Leber, who conſidered the *orbicularis labiorum* as two diſtinct muſcles. His words are,—"when we examine carefully the angles of the lips, we find that the fibres of the upper lip interſect thoſe of the under lip, and we eaſily diſtinguiſh the muſcular arch of one lip from that of the other; and for this reaſon I divide this muſcle into two, and I call them either by the common name of *Semi-Orbicularis*, or I call one of them *Semi-Orbicularis ſuperior*, and the other *Semi-Orbicularis inferior*; but the name of *Semi-Ovales* would be ſtill more proper (*Exp. Anat Vol.* II. *Sect.* X. § 553.)." A Hare-Lip is a natural diviſion of the ſuperior part of this muſcle.

(176) Douglas called it *Depreſſor Labiorum communis.* Winſlow called it *Triangularis.* But Schreiber obſerves that, if it be named from its figure, he would call it *Lunatus* (Douglas *Verſio Latina cum notis.*).

the

the middle of the lower lip, in which it is confounded with the *ſphincter labiorum* and the *depreſſor anguli oris* (177).

11. The *Levator Menti*, or *Inciſivus inferior*, ariſes from an excavation in the under jaw, above the chin, immediately below the *inciſores*: it deſcends and ends in the ſkin of the chin (178).

Its *Uſe* is to raiſe the chin and lower lip.

12. The *Latiſſimus Colli*, or *Platyſma-Myoides*, and its fellow, cover the whole anterior, and lateral parts of the neck. This broad thin muſcle ariſes from the clavicle and *humerus*, paſſes obliquely over the neck to the lips, and almoſt to the ears, and ends in the ſkin of the face.

Its *Uſe* is to pull the ſkin of the neck downwards, and ſomewhat laterally (179).

The Muſcles of the Lower Jaw.

The *Lower Jaw* has five pair of muſcles: accordingly it is moved by ten muſcles.

(177) Winſlow called it *Quadratus*, and Douglas *Depreſſor Labii Inferioris proprius*.

(178) Innes called it *Levator Labii inferioris*, and Douglas *Elevator Labii inferioris proprius*.

(179) Winſlow and Innes called this muſcle *Muſculus Cutaneus*. Douglas called it *Quadratus Genae*, or *Latiſſimus Colli*; which latter appellation is alſo given to it by Albinus. This muſcle has no tendon. When the jugular veins are opened, this muſcle is unavoidably wounded. Bronchotomy, Tracheotomy, or Laryngotomy, is performed between the two muſcles.

1. The

1. The *Maſſeter.*
2. The *Temporalis.*
3. The *Pterygoideus internus.*
4. The ——— *externus.*
5. The *Biventer Maxillae inferioris.*

1. The *Maſſeter* is a thick, ſtrong muſcle, ariſing by a double or triple beginning from the *zygoma*, and from the inferior part of the *os malae* it deſcends ſomewhat obliquely, and adheres to the external ſurface of the angle of the lower jaw.

It muſt be remembered that the duct of the parotid gland runs over this muſcle.

Its *Uſe.* It concurs to raiſe the lower jaw, and to ſhut the mouth [180].

2. The *Temporalis* is a broad flat muſcle, ariſing from the ſemicircular ridge that is conſpicuous on the ſides of the ſkull; therefore, it is connected to the *os frontis*, *os ſyncipitis*, and *os temporale*; and it covers the whole of the incloſed ſurface, the temporal and zygomatic depreſſion, and is defended by the two *laminae* of the *cranium*, which ſeparate from each other in this place. Its fleſhy fibres come nearer to one another, at the zygomatic arch, they become tendinous externally, but internally they retain their former fleſhy nature; they paſs under the zygomatic arch, and adhere,

[180] Mr. Hunter has treated very accurately of the figure, articulation, and motion of the lower jaw; and they who wiſh particularly to underſtand it, may read him (The Natural Hiſtory of the Teeth, &c. Part. I. p. 15. Edit. II.).

by means of a ſtrong tendon, to the coronoid proceſs of the lower jaw. This muſcle is covered, ſuperiorly and inferiorly, by a ſtrong aponeurotic expanſion ([181]).

Its *Uſe*. It raiſes the lower jaw, and, in part, draws it to the ſides.

3. The *Pterygoideus major*, or *internus*, ariſes, by fleſhy fibres, from the cavity of the pterygoid *fovea*, which it almoſt fills, at the inner ſide of the external *ala:* it deſcends obliquely, from this origin, to the angle of the lower jaw; and after becoming tendinous it is inſerted into the inſide of this bone, almoſt in the ſame manner as the *maſſeter* is inſerted into the outſide.

Its *Uſe* is to raiſe the lower jaw, and to draw it to one ſide.

4. The *Pterygoideus minor*, or *externus*, is ſituated almoſt tranſverſely on the external pterygoid proceſs, and head of the lower jaw: it adheres, by a ſmall tendinous beginning, to the external ſurface of the external pterygoid proceſs, and alſo to a part of the lower jaw, contiguous to this proceſs: it paſſes afterwards poſteriorly and externally, and it is connected by another extremity to a ſmall cavity in the lower jaw immediately under its head, and likewiſe to the capſular ligament and the margin of the inter-articular cartilage at this place.

([181]) Winſlow called it the *Crotaphite Muſcle*.

Its *Uſe*. It draws the lower jaw forwards, and cauſes the inferior *inciſores* and *canini* to project before the ſuperior. But it does this, when both muſcles act at once; for, when only one acts, it draws the lower jaw obliquely forwards.

5. The *Digaſtricus Maxillae Inferioris*, ariſes by a tendinous beginning from the inſide of the lower jaw, near its *ſymphiſis*, and above the *mylohyoideus* muſcle: it is thick immediately at its origin, and becoming fleſhy, it goes about the breadth of two fingers obliquely downwards and outwards. It then becomes tendinous, and adheres to the aponeurotic expanſion that covers the *os hyoides*. And paſſing afterwards upwards and backwards over the *ſtylomyoideus* muſcle, which it perforates, it is changed into a ſecond fleſhy belly, which is laſtly inſerted into a depreſſion of the maſtoid proceſs of the temporal bone, by means of a tendon.

Its *Uſe* is to draw down the lower jaw, to open the mouth, and, when the mouth is open, to elevate the *os hyoides* ([182]).

Muſcles of the Os Hyoides.

There are five pair of muſcles proper to the *os hyoides*; five on each ſide: viz.

1. The *Sternohyoideus*.
2. The *Coracohyoideus*.
3. The *Stylohyoideus*.

([182]) Albinus called it "*Biventer Maxillae Inferioris*."

 4. The

4. The *Mylohyoideus.*

5. The *Geniohyoideus.*

1. The *Sternohyoideus* is a long, ſmall, flat muſcle, ariſing ſuperiorly and ſomewhat laterally, by fleſhy fibres, from the internal ſurface of the *ſternum:* it aſcends on the fore part of the neck, and is attached to the inferior margin of the baſe of the *os hyoides.*

Its *Uſe* is to draw the *os hyoides* downwards.

2. The *Coracohyoideus* is very long, thinner than the former, and ariſing from the ſuperior margin of the *ſcapula.* Its fleſhy fibres aſcend very obliquely, and are inſerted laterally into the baſe of the *os hyoides* ([183]).

Its *Uſe* is to draw the *os hyoides* downwards, and ſomewhat laterally.

3. The *Stylohyoideus* is long, and ſomewhat round: it ariſes, by a ſhort tendon, from the baſe of the ſtyloid proceſs of the temporal bone; and it is inſerted into the *os hyoides,* chiefly at the union of the larger *cornua* with the reſt of the bone. The fleſhy fibres of this muſcle, eſpecially at their end, are ſeparated from one another, that the tendon of the *digaſtricus* muſcle may paſs through them ([184]).

([183]) Innes called it *Omo-hyoideus.*

([184]) The belly of this muſcle is generally perforated, on one, or both ſides, by the tendon of the *digaſtricus* muſcle.

Some call this muſcle *Stylo-cerato hyoideus* (Schreiber.).

Another muſcle frequently accompanies this, having the ſame origin, inſertion, and uſe, called *Stylo-hyoideus alter* (Innes).

Its

Its *Use*. When it acts, it draws the *os hyoides* laterally, and upwards.

4. The *Mylohyoideus* is broad, but thin: it adheres to the very small internal and lateral parts of the lower jaw, and the base of the *os hyoides*. It arises near the last *dens molaris*, almost at the symphysis of the lower jaw, at its most anterior part. From hence it passes obliquely inwards, and is joined, in its whole length, with the corresponding muscle of the opposite side, by means of an intervening tendon. Lastly, it is inserted into the superior part of the base of the *os hyoides*.

5. The *Geniohyoideus* is a small, long, flat muscle, arising from the symphysis of the lower jaw, running straight downwards towards the *os hyoides*, and being inserted into its base, under the former.

Its *Use*, as well as that of the *Mylohyoideus*, is to draw the *os hyoides* forwards and upwards.

Muscles of the Tongue.

To the Tongue are destined six pair of muscles: *viz.*

1. The *Ceratoglossus*,
2. The *Bassioglossus*,
3. The *Chondroglossus*,
4. The *Genioglossus*,
5. The *Styloglossus*,
6. The *Lingualis*.

1. The *Ceratoglossus* muscle arises from the large *cornu* of the *os hyoides*, ascends somewhat obliquely, and is implanted in the side of the tongue (185).

Its *Use* is to draw the tongue backwards and laterally.

2. The *Bassioglossus* arises from the base of the *os hyoides*, and its superior margin: its fleshy fibres are lost near the middle of the tongue.

Its *Use* is to draw the tongue backwards and inwards.

3. The *Chondroglossus* is very small; and, if it be present, is composed of a few fleshy fibres, that come from the cartilage connecting the large *cornua* to the base of the *os hyoides*, and are inserted into the tongue laterally (186).

Its *Use* is the same as that of the former.

4. The *Genioglossus* arises by thick fleshy fibres from the symphysis of the lower jaw, runs backwards along the tongue, and is inserted into its under part (187).

Its *Use* is to draw the tongue forwards.

5. The *Styloglossus* is long and small; it arises tendinous from the external part of the

(185) Albinus called it *Basio-cerato-chondro-glossus*, and Innes *Hyo-glossus*.

(186) Douglas comprehends this and the two former muscles under the name of *Ceratoglossus*.

(187) Winslow once called it, in his private lectures, *Musculus Polychrestus*, because of its various actions (*Expos. Anat. Tome* II. *Sect.* X. § 526.).

ſtyloid proceſs, deſcends obliquely by the ſides of the tongue, adheres to it, and ſends off its extremity, from this place, to be inſerted into the tip of the tongue.

Its *Uſe*. When both act, they draw the tongue backwards and upwards; when only one acts, the tongue is drawn towards the ſide of the acting muſcle.

6. Under the name of *Lingualis*, or *Muſculi linguales*, come all thoſe fleſhy fibres of which the tongue is compoſed.

Its *Uſe*. When this muſcle acts, the tongue is contracted, bent, and rendered broader or narrower.

Muſcles of the Pharynx.

The ſuperior part of the alimentary tube, or *pharynx*, conſiſts principally of fleſhy fibres, which adhere to different adjacent parts, and have accordingly different names given by authors. They may all be reduced to the following ſix pair.

Three muſcles of the *pharynx* are *Sphincters*.

1. The *Conſtrictor Pharyngis ſuperior*,
2. —— ———— ———— *medius*,
3. —— ———— ———— *inferior*,
4. The *Salpingopharyngeus*,
5. The *Palatopharyngeus*,
6. The *Stylopharyngeus*.

1. The *Conſtrictor Pharyngis ſuperior* muſcle. As the heads of this muſcle are ſo numerous, anatomiſts

anatomifts have divided it into fo many diftinct mufcles, and have fignalized each by a proper appellation.

The flefhy fibres of this mufcle arife from the *genioglossus*, the *ceratoglossus*, the *buccinator*, the *hamulus* and internal *lamina* of the internal petrous apophyfis, the *circumflexus palati* mufcle, the *ftylopharyngeus*, and many others: they afcend obliquely baekwards, and furround the fuperior part of the *pharynx* on both fides, and are united with the *conftrictor pharyngis medius*.

2. The *Conftrictor Pharyngis medius* arifes from the *cornu* of the *os hyoides*; its flefhy fibres afcend obliquely backwards, furround the middle part of the pharynx, uniting on both fides, and forming an acute angle; and, laftly, they pafs into a thin fmall tendon, which is annexed to the cuneiform procefs of the *os occipitis* near the condyles.

3. The *Conftrictor Pharyngis inferior* is a broad, thin mufcle. It arifes from the inferior procefs of the thyroid cartilage, and alfo from the cricoid cartilage, by broad flefhy fibres These flefhy fibres, like thofe of the *Conftrictor Pharyngis medius*, afcend obliquely backwards, furround the inferior part of the pharynx, and, uniting on both fides, conftitute almoft a perfect acute angle. Becaufe of this double origin, fome authors have made two diftinct mufcles of it, one of which they called *Thyropharingeus*, and the other *Cricopharyngeus*. Laftly, fome have comprehended

prehended the three mufcles above defcribed under one name, *Mufculus Sphincteris Gulae* (188).

The *Ufe* of thefe three pair of mufcles is clear from their names.

4. The *Salpingopharyngeus* arifes from the pofterior extremity of the Euftachian Tube, as well from the bony as the cartilaginous part; it defcends from thence obliquely, is joined with the *ftylopharyngeus* mufcle, and ends in the *pharynx* (189).

Its *Ufe* is to elevate, and confequently to dilate the *pharynx*.

5. The *Palatopharyngeus* arifes from the pofterior margin of the *os palati* the bafe of the *columella*, and alfo from the internal pterygoid procefs: it runs along the foft palate; is turned to one fide, and fomewhat backwards, at the end of the foft palate, defcends on the fide of the *pharynx*, is joined to the *falpingopharyngeus* mufcle, and terminated in the *pharynx* and thyroid cartilage (190).

(188) Douglas confidered the upper part of the *pharynx* as made up only of one pair of mufcles, one on each fide, which he called *Pharyngaeus*: but, in imitation of the accurate Valfalva, he confeffes that he defcribes each different order of fibres feparately, and names it from its origin. Confult Innes.

(189) This mufcle, the *Salpingopharyngeus* of Albinus, is formed of fome of the fibres of the *Thyreo ftaphilinus* of Douglas, or the *Thyro pharyngo-ftaphilinus* of Winflow.

(190) This is the *Thyreo-ftaphilinus* mufcle alluded to in the former note.

Its

Its *Uſe* is the ſame as that of the former muſcle. When it acts, with its fellow, it draws the ſoft palate downwards.

6. The *Stylopharyngeus* ariſes poſteriorly from the middle of the ſtyloid proceſs, by very ſmall tendinous fibres, which immediately become fleſhy, and are united into a round bundle. This bundle deſcends obliquely inwards, is mixed with the fibres of the *palatopharyngeus*, and terminated in the ſides of the *pharynx* and the thyroid cartilage.

Its *Uſe*. When both act, the pharynx is elevated, opened, and ſhortened; when only one acts, it is elevated laterally.

Muſcles of the Soft Palate and Uvula.

The *Soft Palate*, or *Velum Pendulum Palati*, together with the *Uvula*, has the following muſcles, *viz.*

1. The *Palatopharyngeus*,
2. The *Conſtrictor Iſthmi Faucium*,
3. The *Levator Palati Mollis*,
4. The *Circumflexus Palati*,
5. The *Azygos Uvulae*.

1. The *Palatopharyngeus* is already deſcribed among the muſcles of the *pharynx*.

Its *Uſe* is to draw the palate downwards.

2. The *Conſtrictor Iſthmi Faucium* is very ſmall. It ariſes inferiorly from the ſide of the root of the tongue, in the anterior, or ſmall arch of the ſoft palate; it aſcends, and forms a part

a part of this arch, and it is inserted into the *uvula* ([191]).

Its *Use* is to draw the soft palate towards the root of the tongue.

3. The *Levator Palati Mollis* is a strong, fleshy muscle, arising from the extremity of the petrous portion of the temporal bone, and also from the cartilaginous part of the Eustachian tube, being more expanded, it descends to the *uvula*, forms with its fellow coming from the opposite side the posterior, or large arch of the *velum pendulum palati*, and ends in the root of the *uvula* ([192]).

Its *Use* is to apply the palate to the posterior *foramina* of the nose, and the Eustachian Tube.

4. The *Circumflexus Palati*, or *Palatinus Posticus* arises near the preceding from the petrous portion of the temporal bone, from the sharp process of the internal wing of the *os cuneiforme*, and from the cartilaginous part of the Eustachian Tube. Being expanded, it descends from hence through the semicanal of the *hamulus* of the pterygoid process; its tendon is turned backwards, and being united with its fellow, is inserted into the smooth edge of the *os palati* ([193]).

Its

([191]) The *Glosso-staphilinus* of Winslow and Douglas.

([192]) The *Levator Palati Mollis* of Albinus; the *Salpingo-staphilinus* of Valsalva; the *Pterigo-staphilinus externus, vulgo*, of Douglas; the *Petro-Salpingo-staphilinus*, or *Salpingo-staphilinus internus* of Winslow; the *Levator Palati*.

([193]) Winslow called it *Spheno-salpingo-staphilinus*, or *Sta-*

Its *Uſe* is to ſtretch the poſterior ſoft part of the palate, to draw it downwards and forwards, and probably to open the Euſtachian tube.

5. The *Azygos Uvulae* ariſes poſteriorly at the union of the bones of the palate; it deſcends on the poſterior part of the *velum* as far as the top of the *uvula*, and it is there terminated ([194]).

The *Uſe* of this muſcle is to ſhorten the *columella*, and to contract it.

Muſcles of the Larynx.

To the *Larynx*, or *Head of the Aſpera Arteria*, belong three pair of muſcles, *viz.*

1. The *Sternothyroideus*,
2. The *Hyothyroideus*,
3. The *Cricothyroideus*.

1. The *Sternothyroideus* is long, flat and ſmooth. It ariſes from the ſuperior and internal ſurface of the *ſternum*, from the adjacent part of the clavicle, and from the cartilage of the firſt rib. It aſcends from hence over the thyroid gland, and is connected to the ſide of the thyroid cartilage ([195]).

Staphilinus externus. It is the *Muſculus Tubae novus* of Valſalva, the *Palato-ſalpingeus* of Douglas, the *Tenſor Palati* of Innes.

([194]) This ſolitary muſcle is called by Douglas *Palato-ſtaphilinus*, by Winſlow *Staphilinus* or *Epiſtaphilinus*.

([195]) In bronchotomy, the inciſion ſhould be made in the ſmall interſtice between theſe two muſcles.

Its

Its *Uſe* is to draw the thyroid cartilage, and of conſequence the *larynx* downwards.

2. The *Hyothyroideus*, is a ſmall, flat, and narrow muſcle, ariſing from the baſe of the *os hyoides*, alſo from its *cornu*; it paſſes downwards, and is implanted, over the preceding, into the ſide of the thyroid cartilage (196).

Its *Uſe* is to elevate the *larynx*.

3. The *Cricothyroideus* ariſes from the anterior part of the cricoid cartilage, and is inſerted laterally into the thyroid cartilage.

Its *Uſe* is to draw both cartilages nearer to each other.

Muſcles of the Rima Glottidis.

Theſe are the following, *viz.*

1. The *Cricoarytenoideus poſticus*,
2. The ———— *lateralis*,
3. The *Thyroarytenoideus*,
4. The *Arytenoideus tranſverſus*,
5. The ———— *obliquus*.

1. The *Cricoarytenoideus poſticus*, with its fellow of the oppoſite ſide, covers almoſt the whole of the middle of the poſterior part of the cricoid cartilage. It ariſes poſteriorly from its convex ſurface, aſcends obliquely inwards and upwards, and is affixed to the baſe of the arytenoid cartilage.

(196) Innes calls it *Thyreo-hyoideus*.

Its

Its *Uſe* is, with its fellow, to dilate the *rima glottidis*, and to enlarge it.

2. The *Cricoarytenoideus lateralis* is ſmall, and ariſes from the ſide of the cricoid cartilage, aſcends towards the arytenoid cartilage, and is connected laterally with the baſe of the arytenoid cartilage, near the former.

Its *Uſe*. When both act, they draw the arytenoid cartilages aſunder, and conſequently enlarge the *rima glottidis*.

3. The *Thyroarytenoideus* is very ſmall; it ariſes from the inferior and internal part of the thyroid cartilage; it aſcends, and it is inſerted into its anterior part, immediately above the *crycoarytenoideus lateralis*.

Its *Uſe*. When both act, they render the anterior part of the *rima glottidis* narrow.

4. The *Arytenoideus Tranſverſus* is a ſimple muſcle, placed under the former; it paſſes tranſverſely and poſteriorly, from the internal margin of one of the arytenoid cartilages to the internal margin of the other, on the oppoſite ſide. It frequently ſends fibres into the *arytenoidei obliqui* muſcles, and runs with them to the *epiglottis*.

Its *Uſe* is to contract the *rima glottidis*, and make it narrow.

5. The *Arytenoideus Obliquus* is very ſmall and narrow; it is ſmaller than any of the other muſcles of the *rima glottidis*. It ariſes from the baſe of one of the arytenoid cartilages, and aſcends obliquely to the poſterior and

and ſuperior part of the other; in ſuch a manner that the two muſcles decuſſate each other, the right paſſing to the left cartilage, and the left to the right. Afterwards, it is inflected forwards over the anterior part of the cartilages, and goes to the *epiglottis*, in the ſide of which it is loſt.

Its *Uſe*. When both muſcles act, they render the *rima glottidis* narrow.

Some authors refer hither the three muſcles of the *epiglottis*, one *elevator* and two *abductores*; but the fibres of theſe muſcles are often wanting, or are ſo ſmall as not to deſerve particular names.

Muſcles of the Head.

To the Motion of the Head are deſtined thirteen pair of muſcles, viz.

1. The *Sterno-maſtoideus*,
2. The *Cleido-maſtoideus*,
3. The *Rectus Anticus major*,
4. The ———— *minor*,
5. The ——— *lateralis capitis*,

All which five bend the head forwards.

1. The *Splenius Capitis*,
2. The *Biventer Cervicis*,
3. The *Complexus major*,
4. The ———— *minor*, or *Trachelo-maſtoideus*,
5. The *Rectus poſticus major*,
6. The ———— *minor*,

All which ſix bend the head backwards.

1. The

1. The *Obliquus inferior capitis*, or *major*,
2. The ——— *ſuperior* ———, or *minor*.

1. The *Sterno-maſtoideus* ariſes, by a double tendon, from the ſuperior part of the *ſternum* and the anterior extremity of the clavicle, the two ſeparate portions unite immediately, and then aſcend backwards, and are affixed by means of a ſtrong tendon to the maſtoid apophyſis of the temporal bone, and to the *os occipitis*.

2. The *Cleido-maſtoideus* is only that part of the *ſterno-maſtoideus*, which comes from the clavicle (197).

3. The *Rectus Anticus Major*, or *Longus*, ariſes from the fore part of the tranſverſe proceſſes of the ſixth, fifth, fourth, and third *vertebræ* of the neck; it aſcends towards the ſphoenoidal proceſs of the *os occipitis*, and adheres to it, before the articular condyles (198).

4. The *Rectus Anticus Minor*, is about an inch long. It ariſes from the baſe of the tranſverſe proceſs of the firſt *vertebra* of the neck; it aſcends obliquely towards the ſphoe-

(197) Douglas called it ſimply *Maſtoidæus*; but Innes called it *Sterno-cleido maſtoideus*. Leber has named it like Albinus.

The diſeaſe called *Wry-neck* is a contraction of one of theſe muſcles. And in curing it, this muſcle is divided.

(198) This is the *Rectus Internus Major* of Douglas; the *Rectus Anterior Longus* of Winſlow, and the *Rectus Capitis Internus Major* of Innes.

noidal

noidal procefs of the *os occipitis*, and adheres there, near the former ([199]).

5. The *Rectus Lateralis*, which is nearly of the fame length as the former, arifes from the fuperior part of the tranfverfe procefs of the firft *vertebra* of the neck; and, having gone obliquely outwards and upwards, is at laft connected to the *os occipitis*, near the maftoid apophyfis, where this bone is connected with the temporal bone ([200]).

Ufe. All the mufcles now mentioned, when they act on one fide only, incline the head to that fide.

1. The *Splenius*. This broad, flat mufcle arifes from the fpinous proceffes of the five uppermoft *vertebrae* of the back, and the five inferior *vertebrae* of the neck; it afcends obliquely, and adheres to the fide of the *os occipitis*, at the beginning of the maftoid procefs ([201]).

2. The *Biventer Cervicis* arifes from the fpinous proceffes of the *vertebrae* of the back; and, acquiring a double belly, it afcends

([199]) The *Rectus Internus Minor* of Douglas; the *Rectus Anterior Brevis* of Winflow; the *Rectus Capitis Internus Minor* of Innes.

([200]) The *Tranfverfalis Anticus Primus* of Winflow; the *Rectus Capitis Lateralis* of Innes.

([201]) Albinus divides this mufcle into two; the *Splenius Capitis*, or that portion coming from the cervical *vertebrae*, and the *Splenius Colli*, or that portion which comes from the dorfal *vertebrae*. See the Mufcles of the Neck.

to the *os occipitis*, and is affixed to it, near the *complexus major* (202).

3. The *Complexus Major* arifes by many fmall tendons from the tranfverfe proceffes of the two or three fuperior dorfal *vertebrae*, and the fix inferior cervical *vertebrae*; it is inferted fuperiorly into an unequal depreffion in the middle of the *os occipitis*.

4. The *Complexus Minor*, or *Trachelo-maftoideus*, is a fmall and narrow mufcle; it arifes from the fame tranfverfe proceffes as the former; to the tendons of which it is joined at its beginning. It paffes upwards, joins the *fplenius*, and is connected, under the *fplenius*, with the pofterior margin of the maftoid procefs (203).

5. The *Rectus Pofticus Major* arifes from the fpinous procefs of the fecond *vertebra* of the neck; it runs fomewhat obliquely upwards and outwards, and is affixed to the *os occipitis*, under the *complexus major* (204).

6. The *Rectus Pofticus Minor* arifes from the pofterior eminence of the firft *vertebra* of

(202) The *Biventer Cervicis*, fo called by Albinus, is a long portion of the *complexus major*, fituated next the fpinous proceffes, lying more loofe, and having a roundifh tendon in its middle.

The *Complexus Major* is fimply called *Complexus* by Douglas, Heifter, Innes, and moft writers.

(203) Called *Complexus Minor*, or *Maftoideus Lateralis* by Winflow, and *Trachelo-maftoideus*, or *Capitis Par Tertium Fallopii* of Douglas.

(204) Called by Winflow and Douglas, *Rectus Major*, and by Innes, *Rectus Capitis Pofticus Minor*.

the

the neck; it ascends a little obliquely, and adheres, near the former, to the neighbourhood of the *foramen magnum occipitale* ([259]).

1. The *Obliquus Inferior* arises from the spinous process of the second *cervical vertebra*. At its beginning, it is tendinous; but it soon becomes fleshy, goes obliquely outwards to the extremity of the transverse process of the first cervical *vertebra*, and is fixed in its posterior part ([260]).

2. The *Obliquus Superior* arises tendinous, from the extremity of the transverse process of the first cervical *vertebra*; it ascends very obliquely backwards, and is at last connected to the inferior transverse ridge of the *os occipitis*, immediately above the end of the *rectus posticus major* ([261]).

Muscles of the Neck.

The *Motion of the Neck* is produced by ten pair of muscles, taking five parts of the *scalenus* for one only.

1. The *Splenius Colli*,
2. The *Spinalis Cervicis*,
3. The *Interspinales Cervicis*,

Which bend the neck backwards.

([259]) The *Obliquus Minor* of Winslow and Douglas; the *Rectus Capitis Posticus Minor* of Innes.
([260]) *Obliquus Capitis Inferior* of Innes.
([261]) *Obliquus Major* of Winslow; *Obliquus Superior* of Douglas; *Obliquus Capitis Superior* of Innes.

 1. The

1. The *Longus Colli*,

Which bends the neck forwards.

1. The *Tranſverſalis Cervicis*, or *Magnus Colli*,

2. The *Cervicalis Deſcendens*,

Which turn the neck round.

1. The *Scalenus*,

2. The *Intertranſverſarii priores colli*,

3. ——————— *poſteriores* —,

4. The *Levator Scapulae*.

Which turn the neck to one ſide.

1. The *Splenius Colli* is not a diſtinct muſcle; but only a part of the *Splenius Capitis*, (208) adhering to the tranſverſe proceſs of the firſt and ſecond cervical *vertebrae*, by a double ending.

2. The *Spinalis Cervicis* ariſes, by a tendinous beginning, from the tranſverſe proceſſes of the five, or ſix ſuperior *vertebrae*; the tendons immediately uniting, paſs into a fleſhy belly, which becoming tendon, is affixed to the ſpinous proceſſes of the ſecond, third, fourth, fifth, and ſixth cervical *vertebrae* (209).

Its *Uſe* is to raiſe the neck, when inclined forwards, and to turn it obliquely ſideways and backwards.

3. The *Interſpinales Cervicis*. Theſe five ſmall muſcles are ſituated between the ſpinous proceſſes of the ſix inferior cervical *vertebrae*.

(208) See Note 174.

(209) *Semi-ſpinalis*, or *Tranſverſo-ſpinalis Colli*, of Winſlow; *Spinalis*, of Douglas; *Semi-ſpinalis Colli*, of Innes.

The

The firſt of them ariſes from the ſuperior part of the ſeventh cervical *vertebra*, and ends in the inferior and inner part of the ſpinous proceſs of the ſixth. The reſt of the *inter-ſpinales* adhere to the other ſpinous proceſſes of the cervical *vertebrae*, as the firſt to the ſixth ([210]).

Uſe. They draw the proceſſes nearer together, erect the neck, when bent forwards, and draw it backwards.

1. The *Longus Colli* ariſes from the body of the three ſuperior dorſal *vertebrae*, aſcends into the neck, adheres to the bodies of the cervical *vertebrae*, and ends at the anterior eminence of the firſt cervical *vertebra* ([211]).

Its *Uſe* is to erect the neck, when it is bent backwards, to draw it forwards, and ſomewhat ſideways.

1. The *Tranverſalis Cervicis*, or *Magnus Colli*, adheres to the *longiſſimus dorſi*, with which it is often very firmly united. It ariſes from the extremities of the tranſverſe proceſſes of the four or ſix uppermoſt *vertebrae* of the back, by as many ſmall tendons; from hence it aſcends, and is connected by intermediate tendons to the tranſverſe proceſſes of the ſix inferior *vertebrae* of the neck.

([210]) A *vertebra* often wants ſuch a muſcle; ſo that the muſcle from the *epiſtropheus* goes to the fourth cervical *vertebra* (Schreiber.).

Innes ſays, they "are rather ſmall tendons than muſcles, ſerving to connect the ſpinal and tranſverſe proceſſes."

([211]) *Longus* of Douglas.

Its *Uſe* is to draw the neck to one ſide, and to bend it obliquely backwards.

2. The *Cervicalis Deſcendens* ariſes by ſhort tendons from the third, fourth, fifth, and ſixth ſuperior rib; and becoming fleſhy, it aſcends behind the *levator ſcapulae* and *complexus minor*, and is inſerted into the tranſverſe proceſſes of the ſix inferior cervical *vertebrae*; where it is alſo joined to the *ſplenius colli* (212).

Its *Uſe* is to move the neck almoſt like the former.

1. The *Scalenus* ariſes from the external ſurface of the firſt, ſecond, and often the third true rib; it aſcends obliquely to the tranſverſe proceſſes of the cervical *vertebrae*, to which it adheres, in order, from the laſt to the firſt. Between this muſcle are ſituated the nerves and blood-veſſels that go to the arm. This muſcle may eaſily be divided into five ſmall muſcles: hence, in Albinus, and other books, we find the *Scalenus Colli Anterior*, *Poſterior*, *Medius*, *Lateralis*, and *Minimus* (212).

2. The *Intertranſverſarii Priores Colli*. Theſe ſix ſhort, ſmall muſcles paſs from one tranſverſe proceſs of the cervical *vertebrae* to another. Each of them ariſes from the ſuperior and poſterior part of the tranſverſe proceſs of a *vertebra* of the neck, and ter-

(212) The *Cervicalis Deſcendens* is a fleſhy ſlip running from the upper part of the *ſacrolumbaris*, and is ſcarcely at all noticed by ſome Anatomiſts.

(213) Conſult Innes.

minates

minates in the inferior and anterior part of the transverse process of the *vertebra* next above it.

Its *Use* is to draw the neck sideways, and to erect it when inclined to the opposite side.

3. The *Intertransversarii Posteriores Colli*, like the former, arise and ascend from one transverse process of the neck to another. Each of them arises from the superior and anterior part of the transverse process, and goes to the inferior and posterior part of the superior transverse process.

Their *Use* is the same as that of the preceding.

4. The *Levator Scapulae* is a long broad muscle, arising from the transverse processes, on the posterior part, of the second, third, fourth, and fifth cervical *vertebrae*, and being inserted into the superior part of the angle of the *scapula* (214).

Its *Use* is to draw the neck to one side, and somewhat backwards, and to concur with others to raise it, when bent forwards.

Muscles of the Back and Loins.

To the common motion of the back and loins are dedicated the following muscles, viz.

1. The *Multifidus Spinae*,
2. The *Longissimus Dorsi*,
3. The *Sacrolumbaris*.

(214) *Angularis*, vulgo *Levator proprius* of Winslow, *Elevator*, or *Musculus Patientiae* of Douglas.

The following muſcles are deſtined particularly for the *motion of the Dorſal Vertebrae*, viz.

1. The *Spinous Dorſi Magnus*, or *Semi-ſpinalis*,

2. The *Interſpinales Dorſi*,

3. The *Intertranſverſarii Dorſi*,

The following muſcles ſerve for the *motion of the Lumbar Vertebrae*, viz.

1. The *Quadratus Lumborum*,

2. The *Intertranſverſarii Lumborum*,

3. The *Interſpinales Lumborum*,

4. The *Pſoas Parvus*.

1. The *Multifidus Spinae* occupies the poſterior part of the ſpine. It ariſes, by four tendons, from four eminences on the back of the *os ſacrum*; it aſcends obliquely towards the ſpinous proceſſes, and adheres by them to all the *vertebrae* of the ſpine, except the firſt of the neck. So that it is connected to the ſuperior oblique proceſſes of all the lumbar *vertebrae*, to the tranſverſe proceſſes of all the dorſal *vertebrae*, and to the oblique deſcending proceſſes of the ſix inferior cervical *vertebrae*. The tendons of this muſcle do not paſs only to one *vertebra*; but they ſend numerous fibres to the ſecond, third, fourth, and even to the fifth *vertebra* placed above.

Its *Uſe*. By means of its numerous attachments, it retains the ſpine when it is bent forwards; it erects the ſpine, bends it backwards, and, in ſome meaſure, draws it to one ſide.

The

The inferior part of this mufcle is called by fome Anatomifts *Sacer Lumborum* (215).

2. The *Longiffimus Dorfi* is a long, thick mufcle, arifing by flefhy fibres from the pofterior, internal, and fuperior part of the *os ilei*; alfo from the fuperior fpinous proceffes of the *os facrum*; and from the fpines of the four inferior lumbar *vertebrae*, by means of a broad tendon. Befides, it is fixed to the tranfverfe and oblique proceffes of the lumbar *vertebrae*, by flefhy fibres. From its origin, it afcends, united to the *facrolumbari*, the whole length of the back, adhering not only to the angles, but alfo to the tranfverfe proceffes of the feven fuperior dorfal *vertebrae* (216).

3. The *Sacrolumbaris* is a long mufcle, thin and fmall above, but thick and broad below. It arifes pofteriorly from the fuperior and external part of the *os ilei* and *os facrum*, by means of a broad tendon. Afcending hence to the tranfverfe procefs of the lowermoft cervical *vertebra*, it ends in it. In this courfe, it adheres by means of numerous flefhy fibres to all the tranfverfe proceffes of the dorfal *vertebrae*; and by means of numerous tendons, to the pofterior part of almoft all the ribs. From its origin to the laft rib, it

(215) *Semi-fpinalis*, or *Tranfverfo-fpinalis Colli Pars interna* of Winflow.

(216) Innes fays that, "From the upper part of this mufcle there runs up a round flefhy portion, which joins with the *cervicalis defcendens*." See (212).

is

is firmly united to the *longissimus dorsi*. It is united superiorly with the *cervicalis descendens*.

Its *Use*. It serves, together with the *longissimus dorsi*, to bend the loins and spine backwards, when they are inclined forwards, and to erect them, and draw them sideways. The ribs, to which it adheres by its tendons, are particularly drawn downwards by it.

Muscles of the Back.

1. The *Spinosus Dorsi Magnus* is situated laterally at the spinous processes of the back. It arises from the spinous processes of the first lumbar *vertebrae*, and from the three inferior dorsal *vertebrae*, by means of as many distinct tendons. It is confounded in its course with the *longissimus dorsi*; and ends in the spinous processes of the sixth, fifth, fourth, third, and second dorsal *vertebra*.

Its *Use*. It sustains, and erects the back: it draws it somewhat sideways and backwards.

The *Semispinalis Dorsi* of Albinus seems to be a part of the former muscle.

2. The *Interspinales Dorsi* arise from the spinous processes of the dorsal *vertebrae*, as the *interspinales cervicis* arise from the spinous processes of the cervical *vertebrae* ([217]).

Use. They draw the *vertebrae* downwards and near together: of consequence they raise the spine when bent, and draw it backwards.

([217]) See note 210. Innes observes the same of these muscles as of those of the neck.

 3. The

3. The *Intertranſverſarii Dorſi* ariſe from the tranſverſe proceſſes of the dorſal *vertebrae*, in the ſame way as the *intertranſverſarii colli* from the tranſverſe proceſſes of the neck.

It muſt be obſerved, however, that the inferior of theſe muſcles are thicker and larger, and that the ſuperior are ſmaller as they are higher; ſo that the uppermoſt are rather ligaments than muſcles.

Their *Uſe*. They draw the dorſal *vertebrae* near together, draw the ſpine to one ſide; and erect it, or retain it, when bent to the oppoſite ſide.

Muſcles of the Loins.

1. The *Quadratus Lumborum* ariſes by a fleſhy beginning from the poſterior ſpine of the *os ilei*, and from the internal *labium* at the ſuperior margin of the *os ilei*: it ariſes alſo from the tranſverſe proceſſes of the three or four inferior *vertebrae*, by means of as many tendons. It is inſerted into the internal *labium* of the laſt ſpurious rib (218).

Its *Uſe*. It moves the loins to one ſide, and erects them, and retains them, when bent to the oppoſite ſide.

2. The *Intertranſverſarii Lumborum* are ſhort, broad, thick muſcles. They ariſe, and are inſerted like the *intertranſverſarii colli et dorſi*. It muſt, however, be obſerved of them, that

(218) *Quadratus*, or *Lumbaris Externus* of Winſlow.

the

the four firſt are inſerted into the tranſverſe proceſſes of the loins, but that the fifth is inſerted into the loweſt dorſal, and the uppermoſt lumbar *vertebra*.

Their *Uſe*. They move the loins to one ſide, and they erect them, and retain them, when bent to the oppoſite ſide.

3. The *Interſpinales Lumborum* are broad, thin, and tendinous at their origin and inſertion. The firſt goes from the ſpinous proceſs of the laſt lumbar *vertebra*, to that next above it. The ſecond paſſes in the ſame manner from the ſecond ſpinous proceſs to the third. In the ſame manner, one goes from the third to the fourth, and from the fourth to the fifth. The laſt goes from the fifth ſpinous proceſs of the loins, to the laſt ſpinous proceſs of the back.

Their *Uſe*. They raiſe the loins, when they are bent forwards; and draw them backwards: they draw the ſpinous proceſſes near together.

4. The *Pſoas Parvus* is generally, but not always, to be found. It ariſes laterally by a narrow, ſmall, and, in general, tendinous beginning, from the inferior margin of the laſt dorſal *vertebra*, and from the ſuperior margin of the firſt lumbar *vertebra*: it then becomes fleſhy, and ends by a broad, thin, tendon, at that part of the *os pubis*, where this bone adheres to the *os ilei*. Moreover, it ſends off, externally, from its end, a broad thin tendon, that covers the *pſoas magnus* and *iliacus internus*, and deſcends to the region of the *pubis*,

when

when it unites with the *aponeurosis* of the *fascia lata* of the thigh.

Its *Use*. It bends the loins forwards and sideways.

Muscles of the Os Coccygis.

To the *os coccygis* are referred four muscles, two being placed on each side: viz.

1. The *Curvator Coccygis*, or *Sacrococcygaeus*,

2. The *Ischio-coccygaeus*.

1. The *Curvator coccygis* is a small muscle, oblong, narrow, and thin, arising from the inferior part of the internal surface of the *os sacrum*; and terminating tendinous at the second, third, and fourth small bone of the *os coccygis*.

Albinus called this muscle *Curvator Coccygis*, from its office, as it bends this bone forwards. In some subjects, it rather resembles a ligament than a muscle.

2. The *Ischio-coccygaeus* is small, thin, and tendinous at both ends. It arises from the spinous process of the *os ischii*, and terminates by a broad tendon on the inside of the *os sacrum*, and *os coccygis* (210).

Its *Use*. It bends the *os coccygis* forwards towards the *spine* of the *os ischii*, and draws it into its proper situation, when bent backwards.

(210) This is the *Coccygaeus* of Douglas and Innes. Schrieber says, some are of opinion that it draws the coccyx backwards, when *fǽces* are expelled, and during delivery (Douglas *Versio Latina.)*.

It

It likewise strengthens the union of the *coccyx* with the inferior part of the *os sacrum*.

Muscles of the Thorax.

The *Muscles of the Thorax* are

1. The *Intercostales Externi*,
2. ———————— *interni*,
3. The *Levatores Costarum longiores*,
4. —————————— *breviores*,
5. The *Serratus posticus superior*,
6. ———————— *inferior*,
7. The *Triangularis Sterni*,
8. The *Infracostales*,
9. The *Diaphragm*.

1. and 2. The *Intercostales externi* and *interni* are those muscles which fill up the space between the ribs. The *Externi* arise from the posterior extremity of the ribs: their fibres run obliquely forwards, and end at the beginning of the cartilages of the ribs. The *Interni* arise from the *sternum*: their fibres pass, contrary to the others, obliquely from before backwards, and are terminated at the angles of each rib: hence the posterior alone fill the space between the cartilages, and are, on this account, called *Intercartilaginei*. Each series of these muscles is fixed to the inferior margin of the upper rib and the superior margin of the rib next below it.

Use. The Use of both, the *externi* and *interni*, is to draw the ribs near together; and,

as

as the uppermoſt rib is leſs moveable than the reſt, to raiſe the ribs (220).

3. The *Levatores Coſtarum Longiores* are four, proper to the four inferior ribs. The manner of their deſcent is ſuch that they always paſs over the rib next to them, and do not adhere to it, but to the next. Hence, the firſt of theſe muſcles, running to the ninth rib, ariſes from the tranſverſe proceſs of the ſixth dorſal *vertebra*; that running to the tenth rib, from the tranſverſe proceſs of the eighth: and, that, running to the eleventh rib, from the tranſverſe proceſs of the tenth.

They all ariſe tendinous, and, becoming fleſhy, and again tendinous, are inſerted into the ſuperior and external part of the ribs. They are often united, in this courſe, with the intercoſtal muſcles, and with the *levatores coſtarum breviores*.

(220) Hambergerus and others conſidered the *Intercoſtales Interni* and *Externi* as antagoniſt muſcles; the former depreſſing the ribs in expiration, and the latter raiſing them. But Haller proved by experiment and reaſoning that theſe muſcles are not antagoniſts: that the opinion of Hambergerus, however ſpecious, was not founded on true principles; and that both the *Interni* and *Externi* perform one common office of elevating the ribs (*Opuſcula Anat. De Reſpiratione.*)

The *number of intercoſtales externi* and *interni* is forty-four: eleven *externi*, and as many *interni* being on each ſide.

They do *not lift all the ribs* in inſpiration; for the firſt rib is almoſt immoveable, and the reſt are more moveable in the order of their inferiority. But the laſt three or four ribs, according to [illegible], [illegible], and others, either do not aſcend at all, or [illegible] [illegible] inward.

They

They elevate the ribs. Thoſe which are proper to the two laſt ribs, draw them backwards.

4. The *Levatores Coſtarum Breviores* correſpond, in number, to the ribs, twelve being on each ſide. They ariſe from the extremities of the tranſverſe proceſſes of the eleven uppermoſt dorſal *vertebrae*, and of the laſt cervical *vertebra*, in ſuch a manner, that each of theſe muſcles ariſes from the tranſverſe proceſs which is above the rib to which the muſcle goes. They all end, by means of tendons, at the ſharp eminence of each rib, which is obſervable at its departure from the *vertebra*; and at the external part of the ſuperior margin of the rib. The fibres are the ſtraighter as they are nearer the *vertebrae*: and as they are at a greater diſtance from them, they are the more oblique.

Their *Uſe* is to ſtrengthen the firſt rib, and to co-operate with other muſcles in raiſing the reſt ([221]).

5. The *Serratus Poſticus Superior* is ſituated under the *rhomboideus* and *cucullaris* muſcles. It ariſes, by a broad tendinous origin, from the cervical ligament, from the ſpinous proceſſes, and two lowermoſt cervical *vertebrae*,

([221]) Thus Leber follows the example of Albinus in giving the name of *Levatores Coſtarum Longiores* and *Breviores* to thoſe " portions of the external intercoſtal muſcles which ariſe from the tranſverſe proceſſes of the *vertebrae*, where the ribs are fixed to them, and other portions that paſs over one rib, and terminate in the next below it." Innes.

and

and the two uppermoſt of the back. It deſcends from hence obliquely forwards, and is inſerted by means of broad fleſhy and tendinous digitations into the ſecond, third, fourth, and fifth true rib.

Its *Uſe*. It raiſes the rib to which it adheres.

6. The *Serratus Poſticus Inferior* is ſituated under the *latiſſimus dorſi*. It ariſes, by a broad tendon, from the ſpinous proceſſes of the three loweſt dorſal *vertebrae*, and the two higheſt lumbar *vertebrae*. It aſcends from hence fleſhy, and is inſerted by broad, fleſhy digitations into the four loweſt falſe ribs.

Its *Uſe* is to draw the ribs, into which it is inſerted, downwards and backwards.

7. The *Triangularis Sterni* ariſes, by four broad tendons, from the ſecond, third, fourth and fifth rib, anteriorly, on the inſide of the cartilages of the ribs, by means of which theſe ribs are joined to the *ſternum*. The fibres of this muſcle then become fleſhy, and are united together; they deſcend obliquely to the *ſternum*, and end in a long and ſmall tendon, which is annexed to the *ſternum*, near the xyphoid cartilage.

Its *Uſe* is to depreſs, and draw inwards the cartilages of the ribs from which it ariſes. It draws the ſecond rib eſpecially downwards, and the others inwards ([222]).

8. The *Infracoſtales* are thin, flat, fleſhy muſcles, of an indeterminate number, ſituated

([222]) The *Triangularis*, or *Sterno-coſtalis* of Innes.

posteriorly on both sides on the inside of the ribs. They arise from the small heads of the ribs, run obliquely downwards, and terminate in the angles of the ribs; but in such a manner that they are not fixed to the angle of the next rib, but to the angle of the second, or even the third below ([223]).

Their *Use*. They seem to draw the ribs downwards and somewhat inwards.

9. The *Diaphragm* is a strong, broad, double muscle, dividing the cavity of the *thorax* from the *abdomen*. It is placed obliquely between the cavities mentioned, so that the anterior part is placed higher than the posterior; it forms a kind of arch, the superior convex part of which is turned towards the *thorax*, and covered with *pleura*; the inferior and concave part being turned towards the *abdomen*, and covered with *peritoneum* ([224]).

This

([223]) *Costarum depressores proprii* of Cowper and Douglas.

([224]) The Diaphragm, *Septum transversum* of Celsus (*Lib.* 4. *Cap.* 26.).

Though the diaphragm be higher anteriorly than posteriorly, yet it is not highest anteriorly. For, in a dead body the tendinous expansion is higher than the fleshy part. This does not depend on the ascent of the diaphragm into the thorax, in consequence of the pressure of air in the *abdomen*; because, if you wound the *thorax*, and admit air, the tendinous expansion is still higher than the fleshy part of the diaphragm (Haller, *Opusc. Anat. De Musculis Diaph.*).

Some

This muſcle *ariſes* from various parts: it ariſes fleſhy anteriorly from the internal and ſuperior part of the Xiphoid cartilage, and on both ſides, from the cartilages of the ſixth and ſeventh true rib, and of the following ſpurious ribs. Its fleſhy fibres unite near the middle, and form a triangular tendon, which paſſes backwards and downwards (225). Inferiorly, the diaphragm has two, but generally four beginnings on each ſide; theſe beginnings come by fleſhy and tendinous fibres from the tranſverſe proceſs of the firſt, and from the body of the ſecond lumbar *vertebra*; alſo by tendinous fibres, from the third and fourth lumbar *vertebrae*, and their intermediate cartilages. It muſt be obſerved, however, that theſe poſterior beginnings are always lower on the right than on the left ſide. The fibres now mentioned becoming fleſhy, aſcend, and ſoon again become tendinous, and are united to the tendon of the diaphragm that deſcends from above, forming with it the broad tendon of the diaphragm:

Some make the diaphragm conſiſt of two, and ſome of three muſcles, and ſome of only one. But Haller agrees with Cowper, that the diviſion of this muſcle is of no moment (*Ibid.*). There is, however, in moſt books a diviſion of the diaphragm that, in my opinion, ſerves only to create confuſion; for that part of the diaphragm ariſing from the lumbar *vertebrae* is called the *Appendix*, or *Inferior*, or *Leſs Muſcle* of the diaphragm, while the reſt is ſimply called the *Diaphragm*, or the *Superior*, or *Larger Muſcle* of the diaphragm.

(225) *Centrum Tendinoſum*, and *circulus nervoſus*, are names commonly given to the tendinous expanſion of the diaphragm.

 in

in which broad tendon, four particular orders of fibres are confpicuous; one of which is fituated pofteriorly, another paffes from the right to the left fide, the third afcends to the right, and the fourth to the left.

Moreover, different *Foramina* and *Orifices* are confpicuous in the *diaphragm*. Firft, there is an aperture between the pofterior beginnings of the diaphragm, through which pafs the *aorta* (226), the thoracic duct, and fometimes the *vena azygos,* and two large intercoftal nerves, all which are placed without the *pleura*. There is another *foramen* before and above the preceding, between the inferior mufcles of the right and left fide; the lateral and pofterior part of this *foramen* is flefhy, but the anterior part is tendinous. Through this defcend the *oefophagus* and the eighth pair of nerves into the *abdomen*. On the right fide, there is a large *foramen* almoft triangular, in the middle of the broad tendon; this *foramen* is encircled with the four bundles of tendinous fibres above mentioned. Through this *foramen* goes the *vena cava* from the liver to the anterior ventricle

(226) Haller obferves that Car. Stephanus, and other ill-informed anatomifts, have miftaken the paffage of the *aorta*, *vena azygos*, and *ductus chylifer* for a *foramen*: but he fays, that their paffage is behind the *pleura* and *diaphragm*, before the bodies of the *vertebrae*, under the *foramen* for the *oefophagus*, and between the inferior mufcles of the diaphragm *(Opufc.)*; fo that, in fact, there are only two *foramina* in the diaphragm, that deferve to be mentioned.

of

of the heart. And, in this place, the *pleura* joins the *peritonaeum*. The *foramen*, through which the *oesophagus* passes may accordingly be contracted ([227]); but this last mentioned *foramen* cannot be rendered, but a little, smaller, because its fibres cannot contract.

Lastly, there are other *foramina* in the diaphragm, through which pass numerous small nerves and blood-vessels.

When the fleshy fibres of the diaphragm contract, its upper part descends towards the *abdomen*: hence the cavity of the *thorax* is lengthened, and the concave part of the diaphragm, during this action, is rendered flat; therefore, the liver, stomach, spleen, &c. are pressed downwards. The lowermost false ribs are likewise drawn inwards and backwards, during the contraction of the diaphragm ([228]).

The

([227]) In an inflammation of the diaphragm deglutition was observed to be abolished by Heister; and difficult deglutition from a contraction of the diaphragm is not an uncommon symptom in hysterical persons (Haller, *Opusc. de Musc. Diaph. n.* 36.).

The Diaphragm, according to Bartholine and Boerhaave (*Inst. Med.* § 75.), is the superior sphincter of the stomach.

([228]) In ordinary respiration, the diaphragm only acts; the ribs being scarcely moved at all, except that the last two follow the motion of the diaphragm.

When the diaphragm acts, the top of its arch is depressed, and thus the cavity of the *thorax* is elongated, and of course that of the *abdomen* is lessened. Now as the lungs must always be contiguous to the sides of the *thorax*, it

The Muſcles of the Superior Extremities.

Theſe are divided into the muſcles of the *humerus*, the arm, the fore-arm, and the hand.

Muſcles of the Humerus.

To the *humerus* are referred the Clavicle

it follows when the cavity of the *thorax* is enlarged, that a quantity of air muſt ruſh into, and expand the lungs.

The Diaphragm and Intercoſtal muſcles both augment the capacity of the *thorax*, and perform *Inſpiration* (Note 220.). In *Expiration* the diaphragm is relaxed. If reſpiration be laborious, and much blood be brought into the lungs, then the intercoſtal muſcles act in inſpiration, ſo that the thorax is not only rendered wider but alſo longer. In dying animals, and in ſuch as have a very diſturbed breathing, the ribs are raiſed by the *intercoſtales*, the *ſcaleni*, the *pectorales*, and other muſcles. In laborious expiration, the *ſterno-coſtales* and *ſerrati poſtici inferiores* pull down the ribs; and the *quadrati lumborum*, the *ſacro-lumbares*, and the *longiſſimi dorſi* conſpire.

Blumenbach ſays that the *Muſculi obliqui* of both orders, and the *Muſculi tranſverſi*, *Abdominis*, are antagoniſts of the diaphragm (Inſt. Phyſ. § 139.).

Coughing, or violent alternate inſpirations and expirations ſucceeding each other quickly, is cauſed by whatever irritates the reſpiratory ſyſtem.

Laughing is a mental affection, in which frequent, imperfect expirations quickly ſucceed one full inſpiration.

Crying, or *Weeping*, begins by a full inſpiration; after which ſeveral ſmall, alternate, expirations and inſpirations follow, and at laſt a deep expiration, and inſpiration.

Hiccoughing is a very full, ſudden, and ſonorous inſpiration.

Sneezing is produced by whatever irritates the Schneiderian membrane. It is performed by inſpiring fully and expiring very forcibly; ſo that all the expiratory powers are exerted, and air is violently expelled through the noſtrils.

and *Scapula*, to which belong the following muſcles: viz.

1. The *Cucullaris*, or *Trapezius*,
2. The *Subclavius*,
3. The *Serratus Anticus Major*,
4. —— ——— ——— *Minor*,
5. *Rhomboideus*,
6. *Levator Scapulae*.

Muſcle that moves the Humerus.

The *Cucullaris*, or *Trapezius* is a large, flat, thin muſcle, covering the greateſt part of the neck and back. It ariſes fleſhy from the uppermoſt and middle part of the *os occipitis*, from the ſeven ſpinous proceſſes of the cervical *vertebrae*, and from the ſeven, and ſometimes all the ſpinous proceſſes of the dorſal *vertebrae*. Its fleſhy fibres come more cloſely together near the *humerus*, they become tendinous, and end at the ſpine of the acromion, and the poſterior part of the clavicle.

Its *Uſe*. It moves the *ſcapula* and clavicle variouſly, and raiſes the *humerus* backwards towards the head, and draws it directly backwards or downwards. When this muſcle is in action, and thoroughly contracted, it draws the *humerus* backwards towards the ſpine [229].

[229] *Ligamentum Nuchae* is the common tendon of theſe muſcles, which is looſe behind the ſpinous proceſſes of the cervical *vertebrae*.

Muſcle that moves the Clavicle.

The *Subclavius* is a ſmall muſcle, ariſing by a flat tendon from the eminence which the firſt rib has at its connection with the xiphoid cartilage; it then runs fleſhy along the inferior ſurface of the clavicle, and is connected to the inferior and poſterior part of the clavicle.

Its *Uſe.* It draws the clavicle towards the *ſternum*, and moves it forwards and downwards.

Muſcles that move the Scapula.

1. The *Serratus Anticus Major* is a very broad, thin muſcle: it ariſes by ſhort tendinous fibres from the external ſurface of the ſix inferior true ribs, and of the two uppermoſt falſe ribs, by as many digitations; of which the three inferior are united to the digitations of the *obliquus externus abdominis*. Then, becoming fleſhy, it aſcends obliquely, grows narrow at its extremity, and adheres to the internal ſurface of the lowermoſt anterior angle of the *ſcapula* (230).

Its *Uſe* is to draw the *ſcapula* downwards.

2. The *Serratus Anticus Minor* ariſes by its digitations from the ſecond, third, and fourth true rib: it aſcends obliquely, and is affixed by a ſhort, flat tendon to the coracoid proceſs

(230) The *Serratus Magnus* of Innes.

of

of the *ſcapula*, which it draws forwards and downwards towards the *thorax* (231).

3. The *Rhomboideus* is a ſmall muſcle, ariſing tendinous from the ſpinous proceſſes of the four or five inferior cervical *vertebrae*, and the four or five uppermoſt dorſal *vertebrae*. It becomes fleſhy, and deſcends ſomewhat obliquely downwards to the baſe of the *ſcapula*, to which it adheres. It then ſometimes paſſes to the inferior angle of the *ſcapula*, and is there joined to the *latiſſimus dorſi*. Some authors divide this muſcle into two, calling the ſuperior *Rhomboideus parvus*, and the inferior *Rhomboideus magnus* (232): but this diviſion ſeems needleſs.

Its *Uſe*. It draws the *ſcapula* obliquely backwards, and moves it ſomewhat upwards.

4. The *Muſculus Patientiae*, or *Levator Scapulae* may perhaps be referred hither. See its deſcription above among the muſcles of the neck.

Its *Uſe* is to raiſe the *ſcapula* forwards.

Muſcles of the Arm.

To the motion of the arm are dedicated nine muſcles: viz.

1. The *Deltoides*,
2. The *Supraſpinatus*,
3. The *Coracobrachialis*,

(231) The *Serratus Anticus* of Albinus; the *Pectoralis Minor* of Innes.

(232) Innes is of thoſe authors.

Which

Which three raiſe the arm :

4. The *Pectoralis Major*,

Which draws the arm downwards and forwards :

5. The *Teres Major*,

6. The *Latiſſimus Dorſi*,

Which draw the arm backwards :

7. The *Subſcapularis*,

8. The *Infraſpinatus*,

9. The *Teres Minor*,

Which rotate the arm.

1. The *Deltoides*, which is a thick, very ſtrong muſcle, takes its name from its triangular figure, reſembling the Greek letter, *Delta*, △. It ariſes, by a broad tendinous beginning, from the middle and poſterior part of the clavicle, from the *acromion* and the ſpine of the *ſcapula*; running towards the anterior part of the arm, it always becomes narrower, and is connected by fleſhy and tendinous fibres to the longitudinal eminences placed there, between which fibres run. This may eaſily be divided into ſeven other ſmall muſcles.

Its *Uſe*. It raiſes the arm directly outwards ; when the anterior part is contracted, it draws the arm obliquely forwards ; and, when the poſterior part is contracted, it draws the arm backwards.

2. The *Supraſpinatus* fills the whole ſuperior cavity of the *ſcapula*. It ariſes from the poſterior part of its cavity, paſſes over the head of the *os brachiale* under the *acromion*, and

and adheres externally to its large protuberance by a ſhort, flat, thick tendon.

Its *Uſe*. It raiſes the arm forwards, and draws it obliquely outwards.

3. The *Coracbobrachialis* ariſes, by a tendinous and fleſhy beginning, from the coracoid proceſs, where the ſhort head of the *biceps* muſcle ariſes. It is joined to the *biceps* for ſome way, ſo that it appears as if it were a part of this muſcle. It ſeparates from the *biceps*, and ends near the middle of the *os brachiale*, on its inferior and internal part. It is perforated by the external, cutaneous nerves of the arm ([233]).

Its *Uſe* is to draw the *os brachiale* and clavicle near together, and to draw the arm to the ſide of the body.

4. The *Pectoralis Major* is a large, thick, fleſhy muſcle, ariſing tendinous from the whole anterior part of the clavicle, and from the whole length of the *ſternum*, where the cartilages of all the true ribs are joined to it. It alſo adheres externally with the broad tendon of the *obliquus externus abdominis*: the fibres ariſing fleſhy from this part aſcend, but the ſuperior fibres deſcend obliquely; and the middle fibres go tranſverſely to the *os brachiale*, in ſuch a manner, that they continually become leſs in their courſe, and are connected by a ſtrong tendon, four fingers

([233]) The middle of this muſcle is perforated by the nerve called *Perforans*, or *Muſculo-cutaneus*.

breadth

breadth broad, under the head of the *os brachiale*, to the acute line that defcends from the great eminence. From the origin of this mufcle pafs numerous tendinous fibres to the *fternum*, which are united with fibres of the correfponding mufcle coming from the oppofite fide, forming an aponeurotic expanfion, covering the *fternum*, and adhering clofely to it.

Its *Ufe*. It draws the arm, when hanging on its natural fide, near to the fide, and a little forwards. When the arm is raifed ftraight, it depreffes it, and moves it forwards: when the arm is raifed forwards, it bends it towards the breaft. When the defcending fibres of this mufcle only act, they raife the *os brachiale*: when the tranfverfe fibres only act, they move the *os brachiale* forwards; and, when the afcending fibres only act, they not only draw the *os brachiale*, but alfo the whole *fcapula* downwards.

5. The *Teres Major* is an oblong, fmooth, thick mufcle, arifing from the inferior angle of the *fcapula*; afcending, and being inferted by an expanded tendon between both eminences of the *os brachiale*, which it moves backwards and downwards.

6. The *Latiffimus Dorfi* arifes, by a broad tendon, from the four lowermoft fpurious ribs, near their cartilages, from the fpinous proceffes of the fix or eight inferior dorfal, and of all the lumbar *vertebrae*, of the *os facrum*, and from the pofterior part of the iliac

iliac ſpine. Becoming more contracted in its courſe, it goes to the inferior angle of the *ſcapula*, and terminates in a tendon, which is united with the tendon of the *teres major*, and is laſtly affixed to the ſuperior and internal part of the *os brachiale*.

Its *Uſe*. It draws the *os brachiale* downwards, and to the back; it draws it downwards, when elevated, and bends the *ſcapula* and clavicle by means of its inferior fleſhy fibres.

7. The *Subſcapularis* occupies the whole ſurface of the *ſcapula* that is turned towards the back. It ariſes from its poſterior part, almoſt as far up as the neck of the *ſcapula*; becomes gradually ſmaller, like the *ſcapula*, as it runs forwards, till it ends, by a broad tendon, in the ſmall, anterior, eminence of the *os brachiale*. It may eaſily be ſeparated into many ſmall muſcles.

Its *Uſe*. It draws the arm remarkably inwards; hence it is an antagoniſt to the *infraſpinatus* and *teres minor*.

8. The *Infraſpinatus*, like the preceding, filling the cavity above the ſpine, fills the whole cavity below the ſpine. It ariſes from its whole convex ſurface, and alſo from the inferior margin of the *ſcapula*: it is larger than the preceding, and is broader at its beginning, but grows narrower in its courſe like a triangle, till it ends at laſt by means of a ſhort, thick, and broad tendon, in the ſuperior

ſuperior and poſterior part of the ſame eminence as the former.

Its *Uſe*. It rolls the arm, and moves its anterior part outwards from the *thorax*.

9. The *Teres Minor* ariſes from the margin and inferior angle of the *ſcapula*, by a beginning that is partly fleſhy and partly tendinous. It aſcends, becoming broader till it is finally ended in the great eminence immediately at the *infraſpinatus*, and the inferior part of the neck of the *os brachiale*.

Its *Uſe* is the ſame as that of the *infraſpinatus*.

Muſcles of the Fore-arm.

To the motion of the fore-arm are deſtined the following muſcles: *viz.*

1. The *Brachiaeus Internus*,
2. The *Biceps Brachii*,

Which bend the fore-arm:

3. The *Triceps Brachii*,
4. The *Anconaeus*,

Which extend the fore-arm:

5. The *Pronator Rotundus*,
6. The ——— *Quadratus*,
7. The *Supinator Longus*,
8. The ——— *Brevis*,

Which are, all of them, *Pronators* and *Supinators*.

1. The *Brachiaeus Internus* ariſes from that part of the *os brachii* at which the *del-*

tcides

toides ends, by means of a tendon coming from each ſide of the *deltoides:* it is then affixed, by means of fleſhy fibres, internally to the whole acute line of the *os brachiale*, that runs downwards, from the great eminence, paſſes over the articulation, and adheres to the inner and fore ſide of the *corona cubiti* (234).

Its *Uſe* is to bend the fore-arm.

2. The *Biceps Brachii* is compoſed of two muſcles, that are joined together only at their extremity; the one ariſes, by means of a ſhort, broad tendon, from the coracoid proceſs, and deſcends as far as the middle of the *os brachii*. The other muſcle ariſes by a ſmall, long tendon from the ſuperior part of the articular cavity of the *ſcapula*; the tendon paſſes through the capſular ligament, over the head of the *os brachiale*, deſcends in a *ſulcus* between two eminences almoſt to the middle of the arm, where the tendons of both muſcles unite to conſtitute the muſcle, which goes on the inſide of the arm as far as the articulation, where it diſappears, being terminated partly by means of a narrow, round tendon, at the rough eminence of the *radius* projecting under its neck; and being partly expanded into an aponeurotic membrane covering all the muſcles ſituated on the inſide of the fore-arm, and to about three fingers breadth before the articulation of the *carpus*.

(234) The *Brachialis* of Winſlow; the *Brachialis Internus* of Innes.

When

When this aponeurosis is hurt in *venaesection*, bad consequences often arise; which are noticed elsewhere ([235]).

Its *Use*. When the *radius* is rolled forwards over the *ulna*, this muscle rolls it back again. It can also bend the arm.

3. The *Triceps Brachii*. Some anatomists describe under this name three particular muscles: viz. the *Anconaeus Magnus*, the *Externus*, and the *Internus*. The first, or *Longus*, arises by means of a tendon from the inferior part of the neck of the *scapula*, and descends fleshy on the posterior side of the *os brachiale*. The second, or *Brevis*, arises from the external side of the neck of the *os brachiale*, and descends on the outside of this bone. The *Third* arises inferiorly from the outside of the *os brachiale*. They then come together at the inferior part of the *os brachiale*, and form a broad, strong, common tendon, which is fixed to the *olecranon*; from hence a broad, thin aponeurosis, like that of the *biceps*, is expanded over the anterior and posterior part of the fore-arm, covering all the muscles, and ending at the extremity of the fore-arm ([236]).

Its

([235]) The *Biceps Flexor Cubiti* of Innes; the *Coraco-radialis* or *biceps* of Winslow; the *Biceps Internus* of Douglas.

See the Neurology for the remark on a wound of the *aponeurosis* of this muscle.

([236]) The *Anconeus major*, *Anconeus externus*, and *Anconeus internus* of Winslow; the *Biceps externus*, and *Bra-*

Its *Uſe*. The whole of this muſcle deſcends directly downwards, and when it acts, extends the fore-arm. The longer part of this muſcle draws the arm to the ſide of the body, and a little backwards.

4. The *Anconaeus* ariſes by a narrow, ſtrong tendon from the inferior part of the external condyle of the *os brachiale*, and is terminated on the convex ſide of the *ulna*, immediately under the *triceps* ([237]).

Its *Uſe*. It concurs to extend the fore-arm.

5. The *Pronator Rotundus* ariſes from the internal condyle of the *os brachiale*, and paſſes obliquely to the *radius*, into the external margin of which it is inſerted, by a broad tendon ([238]).

Its *Uſe*. It rolls the *radius* and *ulna*, and conſequently the hand which follows the motion of the *radius* inwards.

6. The *Pronator Quadratus* reſembles a regular quadrangle. It ariſes from the inferior part, and the internal ſurface of the cubit, and paſſes tranſverſely to the adjacent inferior and internal part of the *radius* ([239]).

Its *Uſe*. It aſſiſts the action of the preceding muſcles.

Brachialis externus of Douglas; the *Triceps extenſor cubiti* of Innes.

([237]) *Anconeus minor* of Winſlow; *Anconeus*, or *Cubitalis Riolani* of Douglas.

([238]) *Pronator Radii Teres* of Innes.

([239]) *Pronator Radii Quadratus* of Innes.

7. The *Supinator Longus* arifes, by a fmall flat beginning, from the external condyle of the *os brachiale*; defcends over the whole convex furface of the *radius*, in the middle of which it is tendinous; and is inferted, by a fmall tendon, into the anterior part of the inferior condyle of the *radius* (240).

Its *Ufe*. It moves the *radius* to the *ulna*, on both fides: hence, it not only bends the hand outwards, but bends it inwards alfo, when it is bent outwards.

8. The *Supinator Brevis* arifes, by a tendinous beginning, from the external condyle of the *os brachiale*; and by a flefhy beginning, from the eminence of the fuperior and external part of the cubit: it defcends directly forwards, and downwards to the fuperior and internal part of the *radius*, to about the breadth of four fingers under its head: it entirely furrounds the *radius*, and terminates in its middle (241).

Its *Ufe*. It draws the hand outwards, when bent inwards, and draws back the *radius*, when turned about the *ulna*.

Mufcles of the Hand.

1. The *Radialis Externus*,
2. The *Ulnaris Externus*,

Both which extend the hand:

(240) *Supinator Radii Longus* of Innes.
(241) *Supinator Radii Brevis* of Innes.

3. The

3. The *Ulnaris Internus*,
4. The *Radialis Internus*,
Both which bend the hand.

1. The *Radialis Externus* has a double origin, and is accordingly divided into the *Longus* and *Brevis*. They both ariſe tendinous from the external and inferior condyle of the *os brachiale*, deſcend along the external ſurface of the *radius*, paſs into ſmall, flat tendons in the middle of the *radius*, which paſs through a furrow at its inferior extremity; and end on the back of the hand, in ſuch a manner, that the tendon of the longer muſcle is connected to the baſe of the firſt metacarpal bone, and the tendon of the ſhorter to the ſecond (242).

Its *Uſe* is to turn the arm outwards.

2. The *Ulnaris Externus* ariſes from the external condyle of the *os brachiale*, and from almoſt the whole of the external ſurface of the *ulna*.

It deſcends along the *ulna*, and paſſes into a tendon in its middle, which diſappears in the ſuperior part of the fourth metacarpal bone, and the baſe of the firſt phalanx of the little finger (243).

(242) Albinus and Winſlow divide the *Radialis Externus* of Leber: the former, after the manner mentioned by Leber; the latter into *Radialis Externus Primus*, and *Radialis Secundus*. Innes alſo calls the *Radialis Externus Longior* of Albinus, *Extenſor Carpi Radialis Longior*; and the *Radialis Externus Brevior* of Albinus, Innes calls *Extenſor Carpi Radialis Brevior*.
(243) *Extenſor Carpi Ulnaris* of Innes.

Its *Uſe.* It turns the hand backwards, and a little outwards, and likewiſe raiſes it.

3. The *Ulnaris Internus.* It ariſes from the internal condyle of the *os brachiale*, deſcends along the outſide of the *ulna*, and is connected by its tendon to the piſiform and unciform bones of the *carpus* (244).

Its *Uſe.* It bends the hand, and draws it inwards.

4. The *Radialis Internus* ariſes by a broad tendon from the internal condyle of the *os brachiale*, and deſcends obliquely over the *ulna*. Its tendon, beginning about the middle of this bone, paſſes under the internal tranſverſe ligament of the *carpus*; and is inſerted generally into the internal and ſuperior part of the firſt bone of the *metacarpus* (245).

Its *Uſe* is like that of the *Ulnaris Internus.*

Muſcles that move the four Fingers.

1. The *Extenſor Digitorum Communis,*
2. The *Perforatus*, or *Sublimis,*
3. The *Perforans*, or *Profundus,*
4. The *Lumbricales,*
5. The *Interoſſei Interni,*
6. The ——— *Externi,*

1. The *Extenſor Digitorum Communis* ariſes tendinous from the poſterior and inferior part of the external condyle of the *os brachiale*, and deſcends externally along the forearm; being divided at its origin into three

(244) *Flexor Carpi Ulnaris* of Innes.
(245) *Flexor Carpi Radialis* of Innes.

fleſhy

fleſhy parts, each of which ends in a tendon. All theſe three tendons paſs together under the external carpal ligament, and over the back of the hand to the three firſt fingers; when they grow broad, and are joined together by means of numerous tendinous fibres. Each is extended over the back of the finger as far as to the baſe of the anterior phalanx, where they all diſappear.

Sometimes this muſcle paſſes into four tendons, and then one tendon goes to the little finger. Theſe tendons, before they end, adhere to the other phalanges of the fingers, by means of fibres.

Their *Uſe*. They extend all the three phalanges of the fingers, and bend the laſt.

2. The *Perforatus*, or *Sublimis*. It ariſes from the internal condyle of the *os brachiale*, from the ſuperior end of the cubit, from the middle of the *radius*, and from its interoſſeal ligament. The fleſhy body paſſes into four parts, in the middle of the cubit, which are changed into as many tendons. Theſe tendons paſs together through the internal ligament of the *carpus*, and each goes over the palm of the hand to its correſponding finger. Before they come to the ſecond phalanx of the fingers in which they end, they are perforated by the tendons of the *perforantes* muſcles [246].

[246] *Flexor Sublimis Perforatus* of Innes.

Its *Uſe.* It bends the firſt and ſecond phalanges nwards.

3. The *Perforans*, or *Profundus*, ariſes from the ſuperior and middle part of the *ulna*, and from the interoſſeal ligament: it then paſſes into four tendons, which run under the internal interoſſeal ligament to the extremities of the anterior phalanges of the fingers. In this courſe, it perforates the muſcles above it, as has been obſerved already. The tendon of this, and of the former muſcle, runs in a membranous ſheath, from the internal carpal ligament, and in the two firſt phalanges of the fingers, about the middle, being joined to their annular ligaments (247).

Uſe. It bends the third phalanx of the fingers in particular, and the ſecond and the firſt, inwards.

4. The *Lumbricales* are four, thin, ſmall, oblong muſcles, ariſing from the tendons of the *perforans*, under the carpal ligament; paſſing forwards to the fingers, and being implanted by means of a ſhort tendon into the internal ſide of the firſt phalanx. They may be accounted as coadjutors of the former.

Their *Uſe.* They bend the phalanges of the firſt order towards the palm.

5. The *External* and *Internal Interoſſeal* Muſcles occupy the ſpaces between the metacarpal bones. There are three external, and

(247) *Flexor Profundus Perforans* of Innes.

as many internal. The *External* fill the interſtices of the metacarpal bones, on the back of the hand; they ariſe from the inferior part, and from the ſides of the bones of the *metacarpus*; and they diſappear in flat tendons, on the ſides of the fingers, in ſuch a manner, that the firſt is affixed to the external ſide of the middle finger, the ſecond to its internal ſide, and the third to the external ſide of the little finger. The *Internal Interoſſeal Muſcles* are rather placed upon, than between the metacarpal bones. They ariſe from the ſuperior extremity of the metacarpal bones, to which they adhere; and they end in ſuch a manner that the firſt is joined to the internal ſide of the fore-finger, the ſecond to the external ſide of the ring-finger, and the third to the external ſide of the little-finger ([248]).

Their *Uſe*. Each of the *Internal Interoſſeal* Muſcles bends its finger forwards towards the thumb, and ſomewhat inwards; if the finger be curved towards the palm, it is curved more by means of this muſcle. Each of the *External Interoſſeal* Muſcles bends its finger backwards, or draws it from the thumb, and bends it ſomewhat inwards: if the finger be already curved towards the palm, it is more curved, and drawn a little obliquely to one ſide by this muſcle.

([248]) Innes enumerates four *External* and three *Internal Interoſſeal* muſcles.

 Muſcles

Muscles that move the Fore Finger.

1. The *Extensor Indicis Proprius*,
2. The *Abductor Inaicis Proprius.*

1. The *Extensor Indicis Proprius* arises externally from the middle of the cubit, and at the inferior part of the cubit, from the interosseal ligament of the fore arm. Its tendon passes with the *extensor digitorum communis* under the external ligament of the wrist, and ends in the third phalanx of the fore finger.

Its *Use*. It extends the fore-finger only, when we point out any thing; it also bends the fore-finger outwards, and a little backwards towards the middle finger.

2. The *Abductor Indicis Proprius* arises from the superior part of the metacarpal bone, on its inside, by a fleshy beginning, runs towards the metacarpal bone of the fore-finger, adheres to it, and is connected by a broad tendon to the superior part of the first phalanx of the fore-finger. Sometimes it arises by a double tendon.

Use. It draws the fore-finger from the rest towards the thumb, and bends it somewhat towards the palm.

Muſcles that move the Little Finger.

1. The *Extenſor Proprius Digiti Minimi*,
2. The *Abductor Digiti Minimi*,
3. The *Flexor Parvus Digiti Minimi.*

1. The *Extenſor Proprius Digiti Minimi* ariſes by a long tendon from the external condyle of the *os brachiale*; runs fleſhy outwards in the direction of the cubit as far as its middle, and ends in a long ſmall tendon, which unites with the *extenſor digitorum communis*, paſſes under the external carpal ligament with it, goes over the back of the hand to the little finger, and adheres to the phalanges of this finger, as the *extenſor communis* in the other fingers.

Uſe. It extends the three phalanges of the little finger, and bends the firſt outwards.

2. The *Abductor Digiti Minimi* ariſes fleſhy from the piſiform bone of the *carpus*, and from the internal tranſverſe ligament of the *metacarpus*, terminates in a tendon, which unites with the tendon of the preceding muſcle, and ends in the laſt metacarpal bone, and in the ſuperior part of the firſt phalanx of the little finger.

Uſe. It draws the middle from the ring finger; and bends it, and its metacarpal bone, towards the palm.

3. The *Flexor Parvus Digiti Minimi* is ſmall, and by many authors accounted only a part

part of the former; by others however it is called *Metacarpiacus*. It arises from the unciform bone of the *carpus*, and from the internal carpal ligament. Its end and insertion is common to it and to the former. In many instances, it is altogether absent; but, if it be present, it bends the first phalanx, and the whole little finger to the palm, towards the thumb.

Muscles that move the Thumb.

1. The *Abductor Pollicis*, or *Thenar*,
2. The ——————— *brevis*,
3. The *Antithenar*, or *Opponens*,
4. The *Hypothenar*, or *Abductor Pollicis*,
5. The *Flexor Brevis Pollicis*,
6. The ——— *Longus* ———,
7. The *Extensor Minor Pollicis*,
8. The ———— *Major* ————.

1. The *Abductor Pollicis*, or *Thenar* arises tendinous from the external and almost the middle part of the cubit, and from the interosseal ligament; it passes from thence obliquely to the *radius*, which it surrounds, and is fixed to, at the metacarpal bone of the thumb: lastly, it disappears in a smooth tendon in the superior extremity of the last mentioned bone.

Its *Use*. It extends the metacarpal bone of the thumb, when bent towards the palm; it draws it somewhat backwards, and conse-quently

quently draws the thumb from the hand. A part of the tendon of this mufcle is joined to the *abductor pollicis brevis*, and affifts it in acting (249).

2. The *Abductor Pollicis Brevis* arifes from the internal ligament of the *carpus*, and from the *os multangulum majus*; it paffes ftraightly to the fuperior condyle of the firft phalanx of the thumb, to which it is affixed by a part of its tendon. The other part goes over the articulation of this phalanx with the metacarpal bone, paffes upon the back of the hand, and is connected with the tendon of the *extenfor* mufcle of the thumb.

Its *Ufe*. It removes the thumb from the hand, and draws it fomewhat backwards.

3. The *Antithenar* arifes from the firft and fecond metacarpal bones, paffes obliquely to the thumb, and is implanted in its firft phalanx, by means of a ftrong tendon.

Its *Ufe* is to bend the thumb inwards, and to oppofe it to the palm of the hand, and to the fingers.

4. The *Hypothenar* arifes from the *os multangulum magnum*, and from the internal carpal ligament; it paffes from this origin to the thumb, and is inferted, by means of a tendon, united with the tendon of the *flexor brevis pollicis* into the fuperior head of the firft phalanx.

(249) Albinus called the internal portion of the *abductor pollicis manus* by the name of *abductor brevis alter*.

Its

Its *Uſe.* It draws the thumb inwards into the palm of the hand, and to the middle finger.

5. The *Flexor Brevis Pollicis* ariſes internally by tendinous fibres from the inferior part of the *os cuneiforme*, *os capitatum*, and *os multangulum minus*; alſo from the internal carpal ligament, and the adjacent heads of the metacarpal bones. It is inſerted tendinous into the firſt and ſecond phalanges of the thumb. Some of its tendinous fibres are joined with the *extenſor major*, the *abductor brevis*, and the *abductor inferior* of the thumb.

Uſe. It bends the firſt phalanx of the thumb into the palm, and it draws its metacarpal bone backwards, and in ſome degree outwards.

6. The *Flexor Longus Pollicis.* As the fingers have a *perforans* muſcle, ſo likewiſe the thumb has a *flexor.* It ariſes, like that, from the interoſſeal ligament of the fore-arm, and from the middle of the *radius*; it deſcends, on its inſide, with the tendons of the *perforans* muſcle of the fingers; it paſſes under the internal ligament of the *carpus*, turns towards the thumb, and ends in the ſuperior part of the ſecond phalanx.

Its *Uſe.* It bends the firſt and laſt phalanx of the thumb towards the palm.

7. The *Extenſor Minor Pollicis* ariſes immediately under the *abductor longus pollicis* from the *ulna* and the interoſſeal ligament; it runs

 obliquely

obliquely towards the fore part of the inferior head of the *radius*, paſſing at that place, by its ſmall, ſmooth tendon through the carpal ligament, it goes to the back of the hand, and joins the tendon of the *extenſor pollicis major*. It ends ſometimes by its tendon in the ſuperior head of the firſt phalanx of the thumb.

Its *Uſe*. If it be united by its extremity to the tendon of the *extenſor major*, it extends both phalanges of the thumb; but if it be connected by its tendon to the firſt phalanx of the thumb, it only moves the firſt phalanx.

8. The *Extenſor Major Pollicis* ariſes, like the former, from the *ulna*, the interoſſeal ligament, and the external ſurface of the *radius*, by a broad, thin origin, but almoſt entirely cartilaginous; it deſcends a little obliquely, and is changed into a ſtrong and nearly round tendon, which paſſes under the external carpal ligament, goes upon the back of the thumb, and, being generally united with the tendon of the *extenſor minor*, it is attached to the external ſurface of the firſt phalanx of the thumb, near its baſe.

Its *Uſe*. It extends both phalanges of the thumb, and draws them outwards and backwards.

Muſcles that move the Palm of the Hand.

1. The *Palmaris Brevis*,
2. The ——— *Longus*.

1. The *Palmaris Brevis* is a ſmall muſcle, almoſt quadrangular, ſituated under the common integuments. It ariſes by means of a broad, aponeurotic membrane from the external ſurface of the internal carpal ligament near the thumb; alſo, from the beginning of the broad tendon of the *palmaris longus*. It paſſes a little afterwards into fleſhy bundles, and theſe into an *aponeuroſis*, that vaniſhes in the ſkin.

Its *Uſe*. It contracts the beginning of the palm, where it is ſituated, ſo as to make it hollow.

2. The *Palmaris Longus* ariſes by a ſhort tendon from the internal condyle of the *os brachiale*, its body is ſmall and fleſhy, and generally paſſes into a long, ſlender tendon. It deſcends on the inſide of the fore-arm, paſſes over the internal carpal ligament, to which it adheres, goes into the palm of the hand, and is expanded into an *aponeuroſis*, that covers the whole palm, and is compoſed of four diſtinct parts, each of which runs to its finger, and is inſerted into the internal part of the bones of the *metacarpus* and the baſe of the fingers. This *aponeuroſis* defends the tendons, muſcles, veſſels and nerves of the palm.

Uſe.

Use. It contracts the ſkin of the palm.

Muſcles of the Inferior Extremities.

The muſcles that ſerve for the *Motion of the Lower Extremities* are divided, after the manner of the bones to which they belong, into thoſe of the Thigh, thoſe of the Leg, and thoſe of the Foot.

Muſcles of the Thigh.

For the motion of the thigh there are thirteen muſcles; viz.

1. The *Pſoas Magnus*,
2. The *Iliacus Internus*,
3. The *Pectineus*,
4. The *Triceps Femoris*,
5. The *Obturator Externus*,
6. The *Glutaeus Magnus*,
7. The ——— *Medius*,
8. The ——— *Parvus*,
9. The *Pyriformis*,
10. The *Obturator Internus*,
11. The *Gemellus*,
12. The *Quadratus Femoris*,
13. The *Muſculus Faſciae Latae*.

1. The *Pſoas Magnus* ariſes by a tendinous origin from the inferior margin of the laſt dorſal *vertebrae*, and of the four ſuperior lumbar *vertebrae*, and from their tranſverſe proceſſes. It deſcends on the internal ſurface of the *os ilei*, becomes tendinous, and is joined with

with the *iliacus* muſcle. United to this muſcle, it paſſes between the anterior and inferior iliac ſpine, and the oblique eminence of the *os pubis* oppoſite it. Laſtly, it paſſes under Poupart's ligament towards the ſmaller trochanter of the *os femoris*, to which it adheres.

Uſe. It raiſes the *os femoris* forwards, and draws it outwards.

2. The *Iliacus Internus* ariſes from the whole internal ſurface of the *os ilei*; its fleſhy fibres are always contracted, and becoming tendinous are united to the *pſoas magnus*, paſſing with it, as already obſerved, through Poupart's ligament, and ending in the ſmall trochanter of the *femur*. There is often another ſmall muſcle ariſing from the inferior and anterior iliac ſpine, deſcending on its outſide, and being inſerted into the tranſverſe line of the *os femoris* immediately below the *trochanter minor*. It is called by ſome the *Iliacus Parvus*.

Its *Uſe* is the ſame as that of the former.

3. The *Pectineus* ariſes from the acute line of the *os pubis*; it paſſes downwards and outwards, and terminates laſtly in the rough line, below the ſmall trochanter of the *os femoris* (250).

Uſe. It draws one thigh to the other, raiſes it, and turns its fore-part outwards.

(250) *Pectinalis* of Innes.

4. The

4. The *Triceps Femoris* conſiſts of three diſtinct portions: hence, by ſome Anatomiſts, it is divided into three diſtinct muſcles, viz.

1. Into the *Longus*,
2. ——— *Brevis*,
3. ——— *Magnus*, a muſcle of the thigh paſſing inwards.

The *Firſt* ariſes by a ſtrong tendon from the anterior margin of the *os pubis*, near its *ſymphyſis*. It goes downwards and outwards, towards the middle of the *aſpera linea* of the *os femoris*, to which it is affixed ([251]).

The *Second* ariſes immediately below the former from the *os pubis*, and ends in the *linea aſpera* of the *os femoris*, above the tendon of the preceding ([252]).

The *Third* ariſes from the eminence, and the anterior ſurface of the *os iſchii*; its fleſhy fibres deſcend, in the way of the two preceding, and are connected to its *linea aſpera*. When they all unite, they paſs into a common tendon, which deſcends along the *femur*, and is joined poſteriorly to the eminence of the internal condyle ([253]).

Uſe. The three muſcles now enumerated bring one thigh inwards to the other.

([251]) *Adductor Femoris Primus* of Douglas; *Triceps Minus* of Winflow; *Adductor Longus Femoris* of Innes.

([252]) *Adductor Femoris Secundus* of Douglas; *Triceps Secundus* of Winflow; *Adductor Brevis Femoris* of Innes.

([253]) *Adductor Pemoris Tertius*, and *Adductor Femoris Tertius* of Douglas; *Triceps Tertius* of Winflow; *Adductor Magnus Fomoris* of Innes.

5. The *Obturator Externus* arifes externally from the anterior part of the *os ifchii* and *pubis*, anteriorly from the external middle edge, and pofteriorly from the inferior edge of the *foramen ovale* of the *offa innominata*. Its flefhy fibres go fomewhat tranfverfely downwards between the inferior margin of the *acetabulum* of the thigh bone, and the ifchiatic tubercle, through the notch placed there; they are terminated pofteriorly on the infide, at the bafe of the great trochanter of the thigh.

Ufe. With the preceding, it bends the thigh inwards, and rolls it outwards.

6. The *Glutaeus Magnus* is a broad, thick, and flefhy mufcle. It arifes rather flefhy than tendinous from one half of the pofterior part of the external margin of the *os ilei*, from the external ifchiatic ligament, where it is connected with the *longiffimus dorfi*, the *latiffimus dorfi*, and the *facrolumbaris*; and from the external margin of the *os facrum*, the pofterior lateral part of the whole *os coccygis*, and laftly, from the internal furface of the broad *fafcia*. This mufcle, fo broad at its beginning, grows by degrees narrow, paffes obliquely downwards over the greater trochanter of the *os femoris*, till it becomes a thick, broad tendon, which is joined, on the external part of the thigh, with the *broad fafcia*, and terminates, on the back of the thigh, about the breadth of four fingers below the great trochanter [254].

[254] *Gluteus Maximus* of Innes.

Use. It raiſes the thigh backwards towards the ſpine, and rolls it a little outwards. It alſo draws one thigh, when turned over the other, from it.

7. The *Glutaeus Medius* is placed under the former. It ariſes from the whole external ſurface of the *os ilei,* and from its *ſuperior criſta*; its fibres, like thoſe of the former, are contracted as they deſcend, and paſs finally into a ſtrong tendon, which ends in the poſterior part of the great trochanter.

Its *Uſe.* It turns one of the thighs outwards from the other.

8. The *Glutaeus Parvus* is ſituated under the two former; it ariſes from the ſide of the whole external ſurface of the *os ilei*; its fibres paſs in rays, become gradually ſmaller, and terminate by a ſhort, round tendon, which is affixed anteriorly to the anterior margin of the great trochanter ([255]).

Its *Uſe.* It bends the thigh outwards, like the former.

9. The *Pyriformis,* ſo called from its figure, ariſes laterally from the *os ſacrum,* and from the inferior and poſterior adjacent part of the *os ilei.* It paſſes obliquely and a little downwards through the iſchiatic notch, and ends by means of a long tendon in the cavity behind the great trochanter. It is at laſt united with the common tendon of the *obturator internus* and the *gemellus* ([256]).

([255]) *Gluteus Minor* of Albinus; *Gluteus Minimus* of Innes.

([256]) *Pyriformis,* or *Iliacus Externus* of Douglas.

Its *Uſe.* It draws the thigh outwards, when bent forwards, and it draws one thigh from the other, when turned inwards.

10. The *Obdurator Internus* fills up the *foramen ovale* of the *os innominatum* internally, as the *Obturator Externus* does externally. It ariſes by tendinous fibres from almoſt the whole circumference of the *foramen ovale*, and alſo from the ligament cloſing it. There is a ſmall ſpace between theſe tendinous fibres for the paſſage of nerves and veſſels going out of the *pelvis* into the thigh. Its tendon paſſes through the notch, between the tuberoſity and ſpine of the *os iſchii*, is bent in this notch about the *os iſchii*, and goes out of the *pelvis*, almoſt tranſverſely, to the ſuperior and internal part of the whole trochanter, to which it is fixed.

Uſe. It rolls the thigh, like the *pyriformis*.

11. The *Gemellus* is divided by ſome into the ſuperior and inferior. It commonly ariſes by a double beginning externally from the ſpine and tuberoſity of the *iſchium*; it then divides into two, which again unite in one common tendon, which is joined with the *obturator internus*, and ends in the aforementioned cavity, behind the great trochanter ([257]).

Its *Uſe.* It aſſiſts the *obturator internus.*

12. The *Quadratus Femoris* is longer than broad. It ariſes from the external margin

([257]) *Gemini* of Innes.

of

of the tuberoſity of the *iſchium*; its fleſhy fibres go tranſverſely to the thigh, and end in the line between the great and ſmall trochanter.

13. The *Muſculus Faſciae Latae*. This is a ſmall, flat muſcle ariſing tendinous from the outſide of the anterior and ſuperior ſpine of the *ilium*; it immediately becomes fleſhy, and diſappears by ſhort tendinous fibres in the internal ſurface of the broad *faſcia* ([258]).

The *Faſcia Lata* is a ſtrong aponeurotic membrane, ariſing from the external ſide of the ſuperior *criſta* of the *ilium*, from Poupart's ligament, from the ligament of the *obliquus externus abdominis*, and from the inferior part of the *os ſacrum* and the great trochanter; it deſcends on the thigh, and includes all the muſcles placed there. When it paſſes over the knee, it ſurrounds all the muſcles of the leg, and ends in its extremity.

The Uſe of the *Muſculus Faſciae Latae* is to ſtretch the *faſcia*, and to draw the fore part of the thigh inwards.

Muſcles of the Leg.

For the motion of the *Tibia* there are ten muſcles, all which are included in the broad *faſcia*.

1. The *Rectus Cruris*,
2. The *Vaſtus Externus*,

([258]) *Muſculus Aponeuroſis*, or *Faſciae Latae* of Winſlow; *Tenſor Vaginae Femoris* of Innes.

3. The *Vaſtus Internus*,
4. The *Cruraeus*, or *Cruralis*; all which extend the leg.
5. The *Biceps Cruris*,
6. The *Semitendinoſus*,
7. The *Semimembranoſus*,
8. The *Gracilis*,
9. The *Sartorius*,
10. The *Popliteus:* which ſeven bend the leg.

1. The *Rectus Anticus Cruris* ariſes by a ſtrong, double tendon; one part of which ariſes from the anterior and inferior ſpine of the *os ilei*, and another part from the ſuperior margin of the *acetabulum*. From hence it deſcends anteriorly along the thigh, and is united inferiorly with the *Cruralis* muſcle, but laterally with the *vaſti* muſcles. It is inſerted, together with them, into the ham, and the anterior part of the ligament, by which the *patella* is joined to the *tibia*.

Its *Uſe* is to extend the knee, when bent.

2. The *Vaſtus Externus* ariſes from the anterior and external part of the great trochanter, at its baſe, where it unites with the *glutaeus magnus*. From hence it deſcends obliquely, covers almoſt the whole external ſide of the thigh, and is tied by a broad, thick, and ſhort tendon, to the external margin of the *patella*, and to the anterior part of the ſuperior condyle of the *tibia*. It is alſo joined to the ligament of the *patella* and the *faſcia lata*.

Its *Uſe* is to extend the knee.

3. The *Vaſtus Internus* covers the whole internal part of the thigh, as the *vaſtus externus* covers the external part. It ariſes from the oblique eminence under the little trochanter, deſcends like the former, and is inſerted, by means of a broad tendon, into the internal ſide of the *patella*. It joins the tendon of the *rectus anticus cruris*, and the *faſcia lata*: and it is affixed by tendinous fibres on the internal ſide to the ſuperior head of the *tibia*.

Its *Uſe* is likewiſe to extend the knee.

4. The *Cruraeus* ariſes anteriorly from the external part of the *os femoris*, and deſcends to the *patella*: and the fleſhy fibres being changed into a tendinous nature, it is joined to the common tendon of the two *vaſti*, and paſſes with theſe tendons into an *aponeuroſis*, covering the *patella*; and, as was noticed above, affixed to the *tibia*.

Its *Uſe*. It concurs to extend the knee.

5. The *Biceps Cruris* is compoſed of two muſcles, which unite at their inſertion into one common tendon. One of them is longer than the other, and ariſes by a ſhort, ſtrong, and broad tendon, from the tuberoſity of the *iſchium*, joining at this place with the *ſemitendinoſus*. The ſhort muſcle ariſes, commonly in the middle of the thigh, from the *linea aſpera* conſpicuous on its poſterior part. They both deſcend a little outwards, and, becoming tendinous, paſs into a ſtrong, flat, ſhort, tendon, which is affixed to the external ſide of the ſuperior head of the *fibula*.

Use. It bends the knee backwards; and when the knee is bent, it rolls the *tibia* outwards, its anterior part being previously turned inwards.

6. The *Semitendinosus* is so called, because its inferior middle part is composed entirely of tendon. It arises by a small, thick, tendon, from the tuberosity of the *os ischii:* it is united to the longer part of the *biceps cruris,* and terminates afterwards in a long, thick, flat, tendon, which descends posteriorly along the *femur,* and is united to the internal surface below the head of the *tibia,* immediately under the *gracilis* (259).

Its *Use* is to bend the knee backwards. When the knee is bent, it moves the *tibia* inwards, its anterior part being previously turned outwards.

7. The *Semimembranosus* is so called, because its inferior middle part is formed only of a broad membranous tendon. It arises by a long, thick, and almost round tendon, from the superior part of the tuberosity of the *os ischii,* descends along the thigh, and adheres posteriorly immediately under the internal head of the *tibia* (260).

Its *Use* is the same as that of the *semitendinosus.*

8. The *Gracilis* is a long, thin, muscle, arising at the *symphysis pubis* from the ligament

(259) *Seminervosus* of Winslow and Douglas.

(260) The *Semitendinosus,* and *Semimembranosus* form what is called the *Inner Ham-string.* The Tendon of the *Biceps Cruris* is the *Outer Ham-string.*

that

that connects thefe bones ; and below it from the margin of the *os pubis*. From hence it defcends on the infide of the thigh to the fuperior head of the *tibia*, and ends anteriorly on the infide of its head, near the fpine of the *tibia* (261).

Its *Ufe* is to bend the knee backwards: and, when the knee is bent, to roll the *tibia*, in fuch a manner, that the anterior part of the bottom of one foot is turned to the other foot.

9. The *Sartorius* is almoft the longeft mufcle in the body: it arifes by a fmall tendon from the anterior and fuperior fpine of the *ilium*, paffes obliquely over all the mufcles on the anterior part of thigh, goes to the infide of the knee, and there becoming tendinous, is inferted by its broad tendon under the interior head of the *tibia*.

Its *Ufe*. It bends the knee backwards, and rolls the *tibia* in fuch a manner that the anterior part of the bottom of one foot is turned to the other foot, and that, when we fit, we may put one thigh over the other, like a taylor.

10. The *Popliteus* is placed obliquely under the ham. It arifes by a fhort fmall tendon from the external condyle of the thigh, paffes over the capfular ligament obliquely, adheres to it, goes inwards, and ends on the pofterior furface of the fuperior extremity of the *tibia*.

Its *Ufe*. It rolls the *tibia*, when the knee is bent, in fuch a manner that the anterior part of the bottom of one foot is turned to the other.

(261) The *Gracilis Internus*, or *Rectus Internus* of Winflow.

Mufcles

Muſcles of the Foot.

For the *motion of the Foot* there are eight muſcles, connected not only to the *tarſus* but alſo to the bones of the *metacarpus: viz.*

1. The *Gemellus*, or *Gaſtrocnemius*,
2. The *Soleus*,
3. The *Plantaris*:

Theſe three extend the foot.

4. The *Tibialis Anticus*,
5. The *Peroneus Tertius*:

Theſe two bend the foot.

6. The *Tibialis Poſticus*,

This turns the foot inwards.

7. The *Peroneus Longus*,
8. The ——— *Brevis*:

Theſe two turn the foot outwards.

1. The *Gemellus*, or *Gaſtrocnemius*. Under this denomination come two thick, broad, muſcles, oblong, ſeparate at their origin, but united at their inſertion, conſtituting one digaſtric muſcle. They ariſe almoſt entirely tendinous poſteriorly and laterally, immediately above the condyles of the *os femoris*; ſo that one paſſes on the outſide, and the other on the inſide. The two fleſhy bodies of theſe muſcles unite under the calves of the legs, and form a common, broad, ſtrong, tendon; which, joined to the tendon of the *ſoleus* muſcle, forms the very thick, ſtrong, tendon, called *Tendo Achillis*. This deſcends towards the heel, becomes ſmaller, and again becomes expanded,

expanded, ending in the poſterior ſurface of the heel ([262]).

Uſe. They elevate the *os calcaneum*, draw the bottom of the foot backwards, and extend the bottom of the foot.

2. The *Soleus* ariſes, by a broad, double, tendinous origin, from the poſterior part of the *tibia* and *fibula*. It adheres to the poſterior margin of the internal ſpine of the *tibia* beyond the middle of this bone: it becomes leſs in its deſcent, unites with the tendon of the *gaſtrocnemius* to form the *Tendo Achillis*. Its action is like that of the *gaſtrocnemius* ([263]).

3. The *Plantaris* ariſes by a ſmall, flat, tendon, from the external condyle of the *femur*: it paſſes into a fleſhy body, which is ſoon changed into a long, thin, ſmall, tendon, that deſcends between the *ſoleus* and *gaſtrocnemius*, is united to the common tendon, and fixed externally to the poſterior ſurface of the *os calcaneum* ([264]).

Its *Uſe* is the ſame as that of the former.

4. The *Tibialis Anticus* ariſes ſuperiorly beneath the condyle of the *tibia*, from its external ſurface: it deſcends along it, and paſſes into a ſtrong tendon, which goes through the tranſverſe ligament of the *tarſus*, and is connected by means of a double extremity, not only to the ſuperior convex ſurface of the firſt

([262]) *Gaſtrocnemius Externus*, or *Gemellus* of Innes.
([263]) *Extenſor Tarſi Suralis*, or *Extenſor Magnus* of Douglas: *Gaſtrocnemius Internus*, or *Soleus* of Innes.
([264]) *Extenſor Tarſi Minor*, vulgò *Plantaris of* Douglas.

cuneiform

cuneiform bone, but likewife to the bafe of the firft metatarfal bone.

Its *Ufe.* It raifes the anterior part of the bottom of the foot, and of courfe bends it.

5. The *Peroneus Tertius* arifes from the middle of the *fibula:* its tendon paffes through the tranfverfe ligament of the *tarfus*, and ends in the pofterior and fuperior part of the fifth metatarfal bone ([265]).

Its *Ufe* is to concur with the former in bending the bottom of the foot.

6. The *Tibialis Pofticus* arifes flefhy fuperiorly from the pofterior part of the *tibia* and *fibula*, immediately below the articulation of thefe bones with each other. It defcends flefhy, and paffes into a tendon that runs behind the internal angle to the bottom of the foot; where it is divided into numerous portions, and attached on the infide of the foot to the *os naviculare*, and to the pofterior and inferior part of the firft and third cuneiform bone of the *tarfus*, and not uncommonly to the inferior part of the third metatarfal bone.

Its *Ufe.* It raifes the bottom of the foot obliquely inwards and backwards: hence, it rolls the bottom of the foot inwards and backwards.

7. The *Peroneus Longus* arifes fuperiorly from the outfide of the *fibula*, defcends with it, and paffes tendinous behind the external

([265]) *Nonus Vefalii.*

ancle,

ancle, through the ligament that is common to it, and the *peroneus brevis*, into the ſole of the foot, where it diſappears on the inſide of the firſt metatarſal bone ([266]).

Its *Uſe*. It rolls the ſole of the foot outwards, and ſomewhat backwards.

8. The *Peroneus Brevis* ariſes anteriorly from the middle of the *fibula*, becomes tendinous ſoon afterwards, goes with the tendon of the former through the ligament common to both, and is inſerted into the convex ſurface of the fifth metatarſal bone ([267]).

Its *Uſe*. It acts like the former.

Muſcles of the Toes.

1. The *Extenſor Longus Digitorum Pedis*,
2. The ——— *Brevis* ——— ———,
3. The *Flexor Longus*, or *Perforans Digitorum Pedis*,
4. The ——— *Brevis*, or *Perforatus Digitorum Pedis*,
5. The *Lumbricales*,
6. The *Interoſſei Inferiores*,
7. The ——— *Superiores*.

1. The *Extenſor Longus Digitorum Pedis* ariſes from the anterior part of the interroſſeal ligament, and from the inferior and anterior part of the *tibia*, and the internal part of the *fibula*. It deſcends along theſe bones, paſſes obliquely forwards through the tranſverſe ligament of the *tarſus* to the back

([266]) *Peroneus Primus*, or *Poſticus* of Douglas.
([267]) *Peroneus Secundus*, or *Anticus* of Douglas.

of

of the foot; and is there divided into four tendons, which end on the ſuperior convex ſurfaces of the four ſmall toes ([268]).

Its *Uſe*. It extends the phalanges of the toes, into which it is inſerted, and elevates the firſt phalanx.

2. The *Extenſor Brevis Digitorum Pedis* ariſes from the external and ſuperior part of the *os calcanaeum*, goes obliquely inwards over the back of the foot, and is divided there into four portions, each of which is changed into a ſmall, ſmooth, long tendon. The firſt, and largeſt of theſe tendons adheres to the ſuperior ſurface of the firſt phalanx of the great-toe; the three others, united to the tendons of the *extenſor longus*, are inſerted into the phalanges of the three next toes ([269]).

Uſe. It extends the toes.

3. The *Flexor Longus*, or *Perforans*, ariſes from the middle of the poſterior part of the *tibia*, and from the interoſſeal ligament; becoming tendinous, it paſſes behind the internal ancle to the *calcaneum*, to which it adheres by means of a particular ligament; and where it is joined by a bundle of fleſhy fibres coming from the *calcaneum*, which are taken by ſome for the *True Plantar Muſcle*. From this ligament it paſſes obliquely forwards and outwards to the middle of the ſole of the foot, and is there divided into four

([268]) *Extenſor Longus* of Douglas.
([269]) *Extenſor Brevis* of Douglas.

parts;

parts; theſe parts go through the fiſſures of the four tendons of the *perforatus*, and are implanted in the third phalanx of the four ſmall toes (270).

Uſe. It bends all the three phalanges of the four ſmall toes downwards.

4. The *Flexor Brevis*, or *Perforatus Digitorum Pedis* is placed under the plantar *aponeuroſis*: it ariſes from the inferior ſurface of the *calcaneum*, covers the ſole of the foot, and adheres to the heads of the *metatarſal* bones. It ariſes from the inferior and internal ſurface of the *calcaneum*, and, like the former, paſſes into four tendons, which are divided, at their extremity, for the paſſage of the tendons of the *perforans*. Laſtly, theſe tendons are inſerted into the internal ſurface of the middle phalanx of the four ſmall toes (271).

Uſe. It bends the ſecond and firſt ſeries of phalanges of the four ſmall toes downwards.

5. The *Lumbricales* are four ſmall, thin muſcles, very like the *lumbricales* of the hand. They ariſe from the tendon of the *perforans*, and adhere by means of ſmall tendons to the inferior and poſterior part of the firſt phalanx of the four ſmall toes, where they are joined by tendons with the *perforans*.

(270) *Flexor Longus Digitorum Pedis*, *Profundus*, *Perforans* of Innes.

(271) The *Perforatus*, or *Sublimis* of Douglas; the *Flexor Brevis Digitorum Pedis*, *Perforatus*, *Sublimis* of Innes.

Uſe.

Use. They bend the firſt phalanges of the four toes towards the ſole of the foot, and alſo obliquely forwards.

6. The *Interoſſei Inferiores*, three in number, fill the ſpace between the metatarſal bones in the ſole of the foot, as the *Superiores* do in the back of the foot. They ariſe by thin, ſmall tendons, in ſuch a manner, that the firſt, ariſing in the longitudinal direction of the inferior, internal part of the third metatarſal bone, terminates on the inſide of the firſt phalanx of the third toe; the ſecond, ariſing from the internal and inferior part of the fourth metatarſal bone, is inſerted into the internal part of the firſt phalanx of the fourth toe; and the third, ariſing from the internal and inferior part of the fifth metatarſal bone, is inſerted by means of a long, broad tendon, into the internal part of the firſt phalanx of the little toe.

Use. They draw the firſt phalanx of the four little toes towards the great toe, and backwards.

7. The *Interoſſei Superiores* are four in number; the firſt ariſing inferiorly from the ſides of the firſt metatarſal bone, and ſuperiorly from the ſecond metatarſal bone, and ending in the inſide of the firſt phalanx of the ſecond toe; and the other three ariſing from the inſide of the three laſt metatarſal bones, and from the outſide of the ſecond, third, and fourth metatarſal bone, and ending by

ſmall

ſmall tendons in the outſide of the firſt phalanx of the toes.

Uſe. They draw the firſt phalanx of the four ſmall toes from the great toe, and a little backwards.

Muſcles that move the Great Toe.

1. The *Extenſor Proprius Pollicis Pedis,*
2. The *Flexor Longus Pollicis Pedis,*
3. The —— *Brevis* —— ——,
4. The *Adductor Pollicis Pedis,*
5. The *Tranſverſalis Pedis,*
6. The *Abductor Pollicis Pedis.*

1. The *Extenſor Proprius Pollicis Pedis* ariſes anteriorly from the internal and middle part of the *fibula,* from the interoſſeal ligament, and ſometimes from the *tibia* itſelf; becoming fleſhy, it paſſes, like the *tibialis anticus,* through the tranſverſe ligament of the *tarſus,* and ends on the back of the external phalanx of the great toe. This tendon ſends off, on both ſides, a broad, thin, aponeurotic membrane, that exactly covers the phalanges of the great toe ([272]).

The *Uſe.* It extends the firſt and laſt phalanx of the great toe, and bends them backwards.

2. The *Flexor Longus Pollicis Pedis* ariſes poſteriorly from the middle and inferior part of the *fibula,* deſcends tendinous obliquely behind the internal ancle into the ſole of the

([272]) *Extenſor Longus* of Douglas.

 foot,

foot, and ends in the inferior part of the firſt and laſt phalanx of the great toe ([273]).

Uſe. It bends the firſt and laſt phalanx of the great toe downwards.

3. The *Flexor Brevis Pollicis Pedis* ariſes by a broad, but thin tendon from the bottom of the third cuneiform bone, and ſometimes from the *os cuboides* of the *tarſus*; it runs directly to the beginning of the great toe, and is inſerted by one part of its tendon into the *oſſa ſeſamoidea*, between the great toe and the bones of the *metatarſus*, and by the other part into the firſt phalanx of the great toe. It is likewiſe joined to the tendon of the *abductor* and *adductor* of the great toe.

Uſe. It bends the firſt phalanx of the great toe downwards.

4. The *Adductor Pollicis* ariſes tendinous from the inferior part of the fourth, third, and ſometimes of the ſecond metatarſal bone, and from the tendon of the *peroneus longus*; it paſſes to the great toe, and is inſerted by its tendon into the poſterior and inferior part of the internal ſeſamoid bone, and the firſt phalanx of the great toe. The tendon of this muſcle is united with the former and with the *tranſverſalis pedis* ([274]).

5. The *Tranſverſalis Pedis* ariſes generally by a broad, very thin tendon from the anterior extremity of the fifth metatarſal bone, and partly from the plantar *aponeuroſis*; it

([273]) The *Flexor Longus* of Douglas.
([274]) The *Antithenar* of Winſlow.

paſſes acroſs the ſole of the foot, and is inſerted into the ſeſamoid bone, at the inſertion of the *adductor pollicis*, to the extremity of which it is united.

Uſe. When it acts, it renders the anterior part of the ſole of the foot, over which it runs, hollow; becauſe, it draws the great toe to the poſterior toes, and theſe to the great toe.

6. The *Abductor Pedis* ariſes by broad, thin tendons from the *calcaneum*, the *os naviculare*, and *os cuneiforme*: theſe tendons, all of them, unite into a muſcle, which ends by a long, thick, and flat tendon on the anterior extremity of the firſt metatarſal bone, and on the poſterior part of the firſt phalanx of the great toe (275).

Uſe. It draws the great toe from the reſt; and it concurs, with the reſt, to bend the bottom of the foot inwards and downwards.

Muſcles that move the Little Toe.

1. The *Flexor Brevis Digiti Minimi Pedis*,
2. The *Abductor Digiti Minimi Pedis*.

1. The *Flexor Brevis Digiti Minimi* ariſes tendinous from the inferior and poſterior part of the laſt metatarſal bone; and is inſerted into the poſterior, inferior part of the firſt phalanx of the little toe; and into the external margin of the inferior ſurface of the laſt metatarſal bone (276).

(275) The *Thenar* of Winſlow.
(276) The *Parathenar Minor* of Winſlow.

Uſe. It bends the laſt phalanx of the little toe downwards.

2. The *Abductor Digiti Minimi Pedis* ariſes tendinous from the whole external ſurface of the *calcaneum*, runs to the fifth bone of the *metatarſus*; and ends by means of a ſmall tendon outwards, in the ſuperior extremity of this bone, and in the baſis of the firſt phalanx of the little finger (277).

Uſe. It bends the little toe, and the metatarſal bone, downwards; and it draws the little toe from the reſt.

The Abdominal Muſcles.

The Muſcles, that encircle the abdomen, are called the *Abdominal Muſcles.*

There are ten, on each ſide:

1. The *Obliquus Externus Abdominis*,
2. The ——— *Internus* ————,
3. The *Tranſverſus Abdominis*,
4. The *Rectus Abdominis*,
5. The *Pyramidalis*.

1. The *Obliquus Externus Abdominis* is a broad, thin muſcle, fleſhy poſteriorly at its origin, and terminating anteriorly and inferiorly in an *aponeuroſis*. It ariſes ſuperiorly, but ſomewhat laterally from the eight, or nine loweſt ribs, by eight or nine fleſhy digitations; the four uppermoſt are united with four digitations of the *ſerratus major anticus*, the

(277) The *Parathenar Major*, and *Metatarſeus* of Winſlow.

inferior

inferior are united with the digitations of the *ſerratus inferior* and *poſticus*, and with the *latiſſimus dorſi*. It then paſſes obliquely downwards and forwards, is connected anteriorly to the *linea alba*, through its whole length; and terminated at the *criſta* of the *ileum*, and anteriorly at the *os pubis*, by means of a tendon, which is joined with the tendon of the oppoſite *obliquus externus*, ſo that the tendinous parts of theſe two muſcles decuſſate each other at the *os pubis*. Theſe tendons are then divided inferiorly, on each ſide of the *abdomen*, ſo that in men the ſpermatic veſſels, and in women the round ligaments of the *uterus* paſs through the diviſion from the cavity of the *abdomen*.

This fiſſure is called the *Abdominal Ring*, and it is the ſeat of inguinal *herniae*. Below this ring, the muſcle is joined with the *tranſverſus abdominis*, forming with it a tendinous ligament, which is attached to the inferior ſpine of the *ilium*, and anteriorly to the *os pubis*; called the *Inguinal Ligament of Fallopius*, or of *Poupart*. The muſcle deſcends below this, and is joined to the *faſcia lata*. Under this ligament run the tendons of the *pſoas magnus* and *iliacus internus*, and the crural arteries, veins, and nerves. This is the ſeat of femoral *herniae* ([278]).

2. The *Obliquus Internus* is placed under the former. It ariſes by tendinous fibres from

([278]) *Obliquus Deſcendens* of Douglas; *Obliquus Deſcendens Externus* of Innes.

the tranfverfe and fpinous proceffes of the three or four inferior lumbar *vertebrae*, from the fuperior part of the *os facrum*, and from the whole fuperior and anterior margin of the *os ilei*. It afcends from hence forwards and obliquely upwards; and is affixed to the inferior margin of the cartilaginous part of all the fpurious ribs, and of the two loweft true ribs, as far as the *fternum* and xyphoid cartilage. Anteriorly it paffes into a firm *aponeurofis*; the fuperior and inferior part of which is fingle, and is firft inferted into the *linea alba*, over the *rectus abdominis*, and then feparated into two layers, one of which goes over the *rectus*, and the other under it, to the *linea alba*, where they again unite, and difappear in the *linea alba*, and *os pubis* (279).

3. The *Tranfverfus Abdominis* arifes pofteriorly tendinous from the tranfverfe and fpinous proceffes of the four laft lumbar *vertebrae*; inferiorly from the internal *labium* of the fuperior and anterior margin of the *os ilei* and *os pubis*; and fuperiorly from the internal furface of all the falfe ribs, and of the two laft true ribs. It goes to the xyphoid cartilage. The tendinous fibres of this mufcle then go anteriorly into a broad tendon, which adheres to the *aponeurofis* of the *obliquus internus*, and ends in the *linea alba* (280).

(279) *Obliquus Afcendens* of Douglas; *Obliquus Afcendens Internus* of Innes.

(280) *Tranfverfalis* of Innes.

From

From the union of the tendons of theſe three muſcles ariſes that aponeurotic expanſion in the middle of the abdomen, called *Linea Alba.*

4. The *Rectus Abdominis* is of the breadth of three fingers, ſituated in the middle of the *abdomen*, in the courſe of the *linea alba.* It ariſes from the xyphoid cartilage, and from the three laſt true ribs, and the firſt falſe rib, by means of different proceſſes or digitations. It deſcends hence inferiorly in the *linea alba*, and is connected by a broad tendon to the thin, internal *labium* of the ſuperior margin of the *os pubis.*

It muſt be obſerved particularly of this muſcle, that it has three or four tendinous, broad lines, from its origin to the *umbilicus*, and often below it, called the *Tendinous Inſcriptions of the Rectus.* Theſe inſcriptions paſs directly acroſs the fibres of this muſcle. The *Vagina* of the *rectus* adheres to theſe interſections, or tranſverſe lines, which ſeem intended to render the muſcle ſtronger.

5. The *Pyramidalis*, the ſmalleſt of all the abdominal muſcles, is ſituated inferiorly in the middle. It ariſes from the anterior and ſuperior part of the *os pubis*, and is contracted the more as it aſcends the higher, forming, as it were, a pyramid. Laſtly, it diſappears in the *linea alba*, by a tendinous extremity, and ſends very many tendinous fibres into the *rectus abdominis.* This muſcle is often wholly abſent. Sometimes only one is preſent;

ſent; this being then firmer and in the middle. If however both be wanting, then the *rectus* grows wide and thick inferiorly, to ſupply its place.

Uſe. The five abdominal muſcles conſtringe the *abdomen*, preſs all its contents, and promote the excretion of *foeces*, urine, and the expulſion of the *foetus* and *placenta*. When they compreſs the abdominal *viſcera*, they drive the diaphragm upwards, leſſen the cavity of the thorax, and compreſs the lungs. They likewiſe variouſly aſſiſt the motions of the body.

The Diaphragm deſerves to be mentioned among the muſcles of the *abdomen*, as it renders its ſuperior part narrower, and preſſes the abdominal *viſcera* downwards, and conſequently the five muſcles here mentioned outwards.

Muſcles of the Anus.

There are three pair of muſcles belonging to the *anus*, viz.

1. The *Levatores Ani,*
2. The *Tranſverſus Perinaei,*
3. The *Sphincter Ani Internus,*
4. The ———— *Externus.*

The *Levator Ani*, or *Muſculus Ani Latus*, is a broad, thin muſcle, ariſing by a tendinous origin from the ſpine of the *os iſchii*, and from the contiguous internal ſurface of the ſame bone, and from the internal part of the *os ilei*, at its connection; and anteriorly from

from the internal and uppermoſt part of the *os pubis.* The fleſhy fibres deſcend to the poſterior part of the *rectum*, where they unite with the *os coccygis* and the *ſphincter ani internus*; thus covering the *rectum* poſteriorly, and covering in man, the urinary bladder, the ſpermatic gland and *veſiculae ſpermaticae* anteriorly, and in women a part of the *vagina uteri.*

Uſe. When both act at once, they draw the poſterior part of the *rectum* forwards, and raiſe it, leſt it ſhould deſcend in evacuating the *foeces.* It likewiſe ſeems to compreſs the ſpermatic gland, the bulb of the *urethra*, and the *veſiculae ſeminales.*

The *Sphincter Ani Internus* is an oblong, fleſhy, ſtrong, thick ring, conſiſting of the orbicular fibres of the *rectum*, ſurrounding the orifice of the *anus*, and cloſing it ([281]).

The *Sphincter Ani Externus* is a broad, thin, fleſhy muſcle, compoſed of two bundles of fibres, running from the ſides, and uniting both anteriorly and poſteriorly; poſteriorly and ſuperiorly by acute angles to the fleſhy membrane adhering to the *os coccygis*, and anteriorly and inferiorly to the membrane of the *rectum*, and at the middle and ſides to the *acceleratores* implanted in the bulb of the

([281]) The *Tranſverſus Perinaei* is deſcribed among the muſcles of the *Penis.*—This *Sphincter Internus*, as it is called by Albinus, Douglas, and Leber, is nothing more than the circular fibres of the *rectum* itſelf.

urethra.

urethra. It is joined by means of numerous fibres with the *ſphincter internus*, and in women with the *ſphincter vaginae* ([282]).

Its *Uſe*. The orifice of the *anus* is cloſed and conſtringed by this muſcle, leſt the *foeces* ſhould be diſcharged continually; and leſt any thing ſhould enter into the *rectum*.

The Sphincter Veſicae.

This belongs to the urinary bladder. It conſiſts of a *faſcia* of fleſhy fibres, ariſing in men from the *ſphincter ani*, but in women from the *ſphincter vaginae*, and being faſtened to the neck of the bladder, on every ſide, conſtringing it, and preventing the urine from eſcaping.

Hither we may alſo refer thoſe fleſhy fibres, which contract the urinary bladder, and diminiſh its cavity. Theſe however are deſcribed in the Sphlancnology.

The Cremaſter Teſticulorum.

This belongs to the *Teſtes*. It ariſes, one proper to each of the *teſtes*, from the ſeparating fibres of the *obliquus internus abdominis*, and from its tendon called Poupart's Ligament; it deſcends, with the ſpermatic veſſels into the *ſcrotum*, and is there expand-

([282]) The *Sphincter Cutaneus* of Winſlow; the *Sphincter Ani* of Innes.

ed

ed into a *vagina*, by which the *teſtis* is covered, firſt poſteriorly, but afterwards on all ſides. By this muſcle it is alſo compreſſed, elevated, and evacuated ([283]).

Some Anatomiſts refer hither a fleſhy covering of the *ſcrotum*; but this covering is not fleſh, but condenſed cellular membrane, which cannot properly be conſidered here.

Muſcles of the Penis.

1. The *Erectores*, or *Iſchio-cavernoſi*,
2. The *Tranſverſus Perinaei Primus*,
3. The ——— ——— *Secundus*,
4. The *Acceleratores*,
5. The *Compreſſor Proſtatae*.

1. The *Erectores Penis* ariſe from the tu-

([283]) Mr. Hunter propoſes a new name for this muſcle, in animals that undergo a change in the ſituation of their *teſtes*: he ſays, it ſhould be called *Muſculus Teſtis*.

Mr. Hunter remarks that the poſition of this muſcle is very different in the *foetus*, and in the adult. Its ſituation in the *foetus* being the ſame as in animals, the teſtes of which remain through life in the cavity of the *abdomen*. Conſequently, he concludes that the ſame purpoſes are anſwered by this muſcle in the human *foetus* as in thoſe animals (Obſ. on certain Parts of the An. Oec.).

Mr. Hunter mentions this muſcle as coming in part from the *Tranſverſus abdominis*. Wriſberg however declares that he could never diſcover any part of it having ſuch an origin (*De Teſticulorum Deſcenſu, &c. p.* 44. *n.* z.).

beroſity

berofity of the *ifchium*, under the *corpora cavernofa penis*; they afcend forwards and inwards, and they are implanted in the *corpora cavernofa*. From this pofition it is clear, that the *erectores* are not intended to erect the *penis*, as fome writers imagined, but that they rather draw the *penis* downwards from the bones of the *pubis*, and retain it in a middle fituation between the perpendicular and the horizontal([184]).

2. The *Tranfverfus Perinaei Primus* arifes by a fmall, thin tendon from the tuberofity of the *ifchium*, runs to the origin of the *erectores penis*, or *clitoridis* in women, becomes flefhy, and is joined, at the *os ifchii*, with the *erector penis*, and is inferted into the middle of the bulb of the *urethra*, and goes into the *accelerator*.

Ufe. It conftringes the bulb of the *urethra*; agitates it, and draws it backwards.

3. The *Tranfverfus Perinaei Alter* arifes alfo from the tuberofity of the *ifchium*, and ends before the bulb in the *urethra*.

Its *Ufe* is to dilate the *urethra*.

4. The *Acceleratores* arife, on both fides, from the *corpora fpongiofa*, furround the *urethra*, and unite in the inferior, middle part of the bulb. They are united likewife pofteriorly with the *fphincter ani* ([185]).

Ufe.

([184]) *Ifchio-cavernofi* of Winflow.

([185]) Mr. Hunter fays—" I call thefe mufcles *Expulfores Seminis*, as I apprehend their real ufe to be for the

Uſe. When theſe act, they compreſs the bulb, agitate it, and draw it backwards.

In old men, in whom theſe muſcles are debilitated, the laſt drops of urine are never totally expreſſed from the bulb. Hence, art is forced to ſupercede nature.

5. The *Compreſſor Proſtatae* ariſes from the internal ſurface of the *os pubis*, between the bottom of the *ſymphyſis* and the *foramen magnum*. This thin muſcle being inflected, runs backwards, embraces the proſtate, and either diſappears in its inferior part, or is joined with its fellow of the oppoſite ſide.

The Conſtrictor Cunni.

This muſcle is proper to the *vagina*. It ariſes, on both ſides, from the *ſphincter ani*; it is augmented by a bundle of fleſhy fibres coming from the *os iſchii*; it paſſes forwards in the direction of the *labia vulvae*, and it is implanted in the *crura clitoridis*.

the expulſion of that ſecretion." He acknowledges however that they compreſs the bulb, and evacuate the laſt drops of urine; but—" if a receptacle had not been neceſſary for the *ſemen*, thoſe muſcles had probably never exiſted, and the laſt drops of urine would have been thrown out by the action of the bladder and *urethra*, as in ſome meaſure is the caſe in the caſtrated animal" (Obſ. on certain Parts of the An. Oec. p. 39.).

In the lateral operation for the ſtone, the inciſion is made between this and the *Erector Penis*.

Uſe.

Use. When it acts, it compresses the sides of the *vagina*, and thus renders it narrow.

The Erectores Clitoridis.

One of these arises, on each side, from the *os ischium*, and ends in the *corpus spongiosum* of the *clitoris*.

Their *Use* is like that of the *Erectores Penis.*

ANGIOLOGY.

Of the Vessels in general.

ALL the vessels of the human body are either *Sanguiferous*, or *Lymphatic*; we shall treat of the latter in a proper section.

Vessels are distinguished into *Arteries* and *Veins*.

An *Artery* is a membranous, flexible, conical, vibrating canal, extended throughout the body in innumerable ramifications, and destined to carry blood from the heart to every part of the body.

A *Vein* is a flexible, conical, membranous, but not vibrating (286) canal, intended to carry back blood to the heart, from every part of the body.

The *Figure* of the arteries and veins is somewhat like that of a cone; the basis of both

(286) There is no beating of the veins, except the *vena cava* near the heart, and the jugular veins of dying animals. The beating of the arteries, which continues during life, is called the *pulse*. All the arteries, large and small, are dilated at once; though, in the small arteries, the pulsation is not perceivable.

 being

being in the heart, and the apex in the moſt remote parts of the body ([287]).

The

([287]) That a ſection of the arteries, as well as of the veins, is circular, is now generally believed. It may be right to know alſo whether they be conical. Haller well deſerves to be ſtudied on this head (*Elem. Phyſ. Tom.* I.). Marherr would not abſolutely call them cones; he only allowed them to be *ad ſenſum conoidei (Prael. in H. Boerh. Inſ. Med.* § 132.); becauſe whenever an artery runs for ſome length, without giving off any branches, it is found to be cylindrical in that courſe.

Another reaſon againſt their being conical is that the cavity of all the branches is greater than that of the principal trunk, or *aorta*. Haller ſays if the diviſions from the *aorta* to the leaſt artery in the whole body be ſuppoſed to amount only to twenty, yet the proportion of all the branches to the *aorta* will be more than 20 to 1. The arteries may nevertheleſs be called *ſeemingly conical, ad ſenſum conoidei.*

Another reaſon againſt our calling arteries converging cones, is that all the arteries in the human body, wherever they are branched out, are always a little dilated above the diviſion (Edinburgh Med. Eſſays, Vol. 5. p. 806. Haller, *Elem. Phyſ. Tom.* I.).

Moreover, ſome arteries are of larger diameter as they are farther from the heart; as the ſpermatic artery (Monro, *De Teſtibus et Semine.)*: and the capillary arteries are neceſſarily cylindrical, becauſe of the frequent anaſtomoſes of their net-work.

Of the *Branches of Arteries* it may be aſked, how often they divide, while they retain their name? Dr. Keil ſays 40 or 50 times. Haller ſcarcely ever found 20 diviſions.

The *Strength of the Arteries* increaſes inverſely as their diameter decreaſes: or, the ſmaller the arteries are, the ſtronger they are alſo; that is, with reſpect to the contained blood. Hence, the force of the blood is greater againſt the *aorta*, at the heart, than in any other part of the body, the branches being always ſtronger than their reſpective trunk. Hence, aneuryſms happen ſo often in the *aorta* (Clifton Wintringham's Experimental Inquiry

on

The *Arteries* therefore carry the blood from a baſis to an apex; but the *Veins* from an apex to a baſis.

The Arteries are compoſed of the following *Membranes* or *Coats.*

1. An *External* coat always ariſing from the cavities through which the arteries paſs; in the head the external coat is derived from

on ſome parts of the Animal Structure.). The reaſon is clear; for the proportion of containing ſolid, to the contained fluid, increaſes in the inverſe ratio of the diameters; ſo that the ſtrength increaſes in the ſame ratio.

The diameters of two branches are always greater than that of their trunk, each branch being always leſs than its trunk, except the coronary, phrenic, ſpermatic, &c. arteries (Marherr.).

No artery in the body is ſtraight, not the inter-oſſeal, nor the tibial, perinaeal, radial, ulnar, &c. or if any do paſs in a ſtraight courſe, it is ſoon inflected. The uſes of which ſeem to be chiefly, for containing more blood in a given ſpace, for leſſening the *impetus* of the blood flowing into parts, and to prevent thoſe effects, which muſt otherwiſe happen in parts liable to much motion. Anatomiſts however frequently draw them, as if they were ſtraight (Haller, *Elem. Phyſ.*). Perhaps, in the *ſyſtole*, arteries are ſtraight, which become contorted in the *diaſtole*.

Much has been ſaid by Phyſiologiſts reſpecting the angles which the arterial branches make with their trunks. They ofteneſt make an acute angle, or approach ſomewhat to a right angle. They ſeldom form a right angle, and very ſeldom an obtuſe angle. Haller ſays that the only obtuſe, or real right angles are at the origin of the ſpinal arteries, of the inferior arteries of the *cerebellum*, and of the coronary arteries (*Elem. Phyſ.*). The reaſon is evident; an acute angle being the fitteſt, in projectile motion, to throw bodies to a great diſtance.

An *Anaſtomoſis* is formed by two trunks directly uniting, or being united by means of an intermediate branch (Haller, *Elem. Phyſ.*).

the *dura mater*; in the *thorax* from the *mediaſtinum*; in the *abdomen* from the *peritoneum*.

2. The *Cellular* coat, which is next to the external, looſely encircles the arteries; it is often filled with fat in the large arteries, and ſerves to ſuſtain the veſſels which nouriſh the arteries.

3. The third coat, which is *Muſcular*, is compoſed of fleſhy fibres, which being like arcs, many of them peculiarly diſpoſed, conſtitute the whole circumference of an artery.

4. This coat conſiſts of cellular membrane, which adheres firmly to the muſcular coat.

5. The laſt coat is the *Internal*; it is of a white colour, a firm texture, and has a very ſmooth ſurface.

Theſe coats have arteries by which they are nouriſhed, and veins, and nerves (288).

The *Origin* of all the arteries is either from

(288) Theſe ſmall arteries and veins, which may often be ſeen in the recently dead body, and may often be filled with a coloured liquor from the trunks on which they ramify, are known by the name of *Vaſa Vaſorum*. But Anatomiſts ſeem hitherto to have forgotten to mention lymphatics among the *vaſa vaſorum*, which Mr. Cruikſhank has ſeen covering the *aorta* almoſt throughout its whole length, filled with mercury (p. 62.). The trunks of the abſorbents often make grooves in the coats of arteries.

The *Nerves of Arteries* either encircle them by a kind of net-work, or make ſemicircular turns round them. Hence, bluſhing and its contrary may be explained.

The *Nerves of Veins* are fewer than of the arteries, the veins being more paſſive.

 The

The *Pulmonary Artery*, which begins at the anterior, or right ventricle of the heart;—or from

The *Aorta*, which arifes from the pofterior, or left ventricle of the heart.

The *Termination* of all the arteries is

1. In the beginning of the veins [289]; or

2. On the external furface of the body [290]; or

3. In cavities, where they exhale a very fubtile fluid.

4. In excretory veffels, which feparate from the blood a fluid, noxious to the body, v. g. the matter of perfpiration.

5. In particular ducts, or *finufes*, into which blood is fometimes poured, v. g. the Fallopian tubes, *Penis*, &c.

6. In fecretory organs, v. g. the Liver, Tefticles, &c.

7. In glands, where they depofite a part of the blood.

[289] Perhaps no artery terminates by a blind extremity. The change of arteries into veins, without any intermediate *parenchyma* was almoft entirely unknown to the ancients. They imagined, indeed, that blood effufed into cavities, and coagulated, formed the greater part of all the *vifcera*; they called the fpleen and the liver *parenchymata*. For *parenchyma* properly fignified, among them, blood extravafated and coagulated. In general, every artery has its correfponding vein, and the vein is reflected backwards, and paffes from the end of the artery towards the right fide of the heart.

[290] The arteries that terminate on the furface of the body, pour out the fweat, and the matter of perfpiration. The exeretory veffels (4.) are probably only the ends of the arteries.

The *Use of the arteries* is to convey blood from the heart to every part of the body; to separate a liquor from the blood necessary to nutrition and life, and to exterminate whatever is useless, or hurtful.

The *structure of the Veins* is the same as that of the arteries, excepting that the veins have no muscular coat.

The veins differ from the arteries.

1. Veins are generally thinner, and weaker, than arteries.

2. Their diameter is greater than that of the arteries with which they are connected; there is, however, an exception to this, the diameter of the pulmonary arteries being equal and similar to that of the pulmonary veins ([291]).

3. The number of veins is greater than that of arteries ([292]).

4. Veins

([291]) Consult Monro in the Medical Essays and Obs. Vol. II. and Cruikshank's Anatomy of the Absorbing Vessels. Ed. II. p. 60. It was necessary that the arteries should be less than the veins, because the velocity of the blood is so much greater in the arteries than in the veins; it is supposed by Dr. Hales to be nearly as 16 to 1.

But in a *foetus*, the orifice of the pulmonary artery is somewhat larger than that of the *aorta*; for the lungs of a *foetus* being collapsed, the pulmonary artery cannot propel all its blood through the lungs, but sends it through the *ductus arteriosus* into the *aorta*. So that the pulmonary artery is more distended in a *foetus*. For other reasons of the equal size of the orifices of the *aorta* and pulmonary artery consult the notes upon the difference between the embryo and the adult.

([292]) The number of the veins, as well as their capacity, is greater than of the arteries. But there are exceptions to this; in the umbilical cord there are two arteries

4. Veins do not vibrate.

5. Their feat is more fuperficial than that of the arteries ([293]).

6. The veins have more valves than the arteries ([294]).

A *Valve* is a femilunar fold, eafily moved, and continued from the two internal coats of the veffel. Its concave furface is towards the heart, and its convex furface towards the parts diftant from the heart. The valves are connected by a femilunar margin to the interior fide of the veffels, from which they arife; the external margin of the valves moves freely in the cavity of the veffels. There is oftener only one valve, fometimes two, or three on the fides of a veffel.

arteries to one vein; as there are alfo in the *penis*, *clitoris*, gall-bladder, &c. but in thefe examples, the great fize of the veins compenfates for their fmall number.

([293]) The cutaneous veins are turgid in fummer, but almoft wholly contracted in winter. The Arteries and Veins generally accompany each other, but not every where, in the body. They do not accompany each other in the brain. The capillary branches of both kinds generally accompany each other.

The veins forfake the arteries many times; thus the cephalic, bafilic, *venae faphaenae*, and the external jugular vein, pafs along under the fkin, accompanied by no arteries, or by very fmall branches.

In general the trunks of the veins lie immediately under the fkin, and fend off branches inwards; but the arteries, on the contrary, lie deep and fafe from injuries, and fend off branches outwards.

([294]) The arteries have no valves, except the *aorta* and pulmonary artery at their beginning.

Haller believed the veins to have fewer windings than the arteries (*Elem. Phyf.*).

The *Use* of the valves is to prevent the blood from being moved towards the apex, or narrower part of the veins.

All the veins have not valves, as will be particularly noticed in the proper place.

The veins arise,

1. From the whole surface of the body ([295]).

2. From

([295]) Red veins do not arise from the surface of the body by open mouths, nor from the internal cavities mentioned by Leber, 2. Consequently they do not absorb from the surface of the body, nor from the surface of internal cavities. It was imagined by Meckel, Haller, Kaaw, Boerhaave, Leiberkun, and others, that veins do absorb: but Mr. John Hunter has proved that they do not (Medical Comment. by Dr. W. Hunter.).

"I know there are lymphatics in the mother's part (of the *placenta*); but there the veins also arise by open mouths, out of cells, and the blood contained in these cells enters these mouths, and mingles with the circulating blood. This, according to some, is clearly venous absorption; the structure of the corpora cavernosa, penis and clitoris, seems a good deal to resemble that of the mother's part of the placenta, and the veins appear to arise from cells there too. That the blood gets into these veins, from those cells, I do not doubt; but I used to explain this as circulation of the blood, not absorption, in the way Hervey conceived it to be, in the other parts of the body, nearly; that is, he conceived the blood to be thrown from the arteries into a parenchyma, or spongy texture, interposed between the ends of the arteries and beginnings of veins; and that the vis a tergo, in the arterial blood, propelled it not only through the sponge, but into the veins. Doctor Fordyce says, there must be something else in the structure of these parts, not yet understood, and rejects not only the solution I have given, of the passage of blood into veins, but denies the possibility of venous absorption any where, on the principles of hydrostatics, independent of the other arguments I have given. Supposing, says he, an opening made in a vein, there is a pressure equal to the force of

2. From the ſurface of internal cavities.

3. From the ends of the arteries.

4. From particular cavities, e. g. the *corpora cavernoſa* of the *penis*, *urethra*, *vagina*, &c.

5. From lymphatic glands:

The veins end,

1. In the *Vena Cava*,

2. In the Pulmonary Veins,

3. In the *Vena Portae*, but laſtly in the *ſinuſes* and auricles of the heart.

The *Office* of the veins is to return the blood from every part of the body to the heart; to abſorb the fluids exuded on the external and internal ſurface of the body, and to carry them alſo to the heart.

of the circulation in the veins, to force the blood out at this opening; it would therefore flow out, and remain out, unleſs there was a force ſuperior to this preſſure to throw it in again; but we know of no ſuch force exiſting in the veins of the common ſtructure. Nor is it poſſible that the vis a tergo, alledged by Hervey, can produce the ſuppoſed effects; for the cells of the ſuppoſed parenchyma, of the placenta, and corpora cavernoſa, mentioned, are not tenſe at the time of the venous abſorption, as it has been called. We know of no force in cavities capable of overcoming the preſſure of the venous blood on the ſides of the veſſels, and of propelling fluids into their ſuppoſed open extremities, though we can eaſily conceive the muſcular force of the lymphatics overcoming this preſſure, in the angles between the jugulars and ſubclavians, for reaſons which will be mentioned afterwards." Cruikſhank's Anatomy of the Abſorbing Veſſels, p. 28.

Of the Arterial Syſtem in general.

The *Aorta* is ſcarcely ariſen from the heart, before it ſends off the *coronary arteries*; it then paſſes to the left ſide of the ſpine, forming its *curvature*, and as it deſcends by the ſide of the ſpine, it acquires the name of *aorta deſcendens*.

From the convex part of the curvature, or arc, of the *aorta* there ariſe three veſſels, viz.

1. *Arteria innominata*, which divides into
    a. The *Right Carotid*, and
    b. The *Right Subclavian*.
2. The *Left Carotid*.
3. The *Left Subclavian*.

Each CAROTID ARTERY is divided into *external* and *internal*: the *external* gives off four branches:

Anteriorly,

1. The *ſuperior thyroideal*, or guttural,
2. The *ſublingual*, or *ranine*,
3. The *inferior maxillary*,
4. The *external maxillary*; from which ariſe,
    a. The *mental*,
    b. The *coronary* of the lips [296],
    c. The *angular*.

Poſteriorly,

5. The *aſcending pharyngeal*,
6. The *occipital*,
7. The *external auditory*, and

[296] The *coronary arteries* of the lip ſend off many ramifications without decreaſing in ſize. The reaſon of which is very eaſily aſſignable, from conſidering the junction of the left and right trunks (Haller, *Elem. Phyſ. Tom.* I.).

8. The

8. The *temporal*; of which

a. The *Frontal* is a branch.

On the internal ſide of the lower jaw, near the articular condyle, the external carotid is called *internal maxillary*; its branches are

1. The *ſphaeno maxillary*; from which ariſe

a. The *anterior of the dura mater*,

b. The *ſuperior alveolar*, and

c. *Superior maxillary*.

2. The *inferior alveolar*.

3. The *middle artery* of the *dura mater*, or *ſphoeno-ſpinoſa*.

The INTERNAL CAROTID, or *cerebral* gives off within the *cranium*

1. The *ophthalmic*, or *internal orbitary*: whence ariſes

a. The *ciliary*, and in general

b. The *central artery* of the *retina*.

The *internal carotid* being then divided into two principal branches, of which the one is called

a. *Anterior cerebral*, the other

b. *Poſterior cerebral*.

The SUBCLAVIAN ARTERY is divided into the four following principal branches:

1. *Internal mammary*, from whence comes

a. The *mediaſtinal*,

b. The *thymal*, and

c. The *pericardiac*: from this laſt alſo is derived,

α. The *ſuperior diaphragmatic* and

β. The *tracheal*, or *inferior guttural*.

2. *Cervical*, which is either

a. *Anterior cervical*, or

b. *Poſte-*

b. *Poſterior cervical.*

3. *Vertebral,* which uniting within the *cranium* form the *Baſilary* artery.

From theſe branches there ariſe alſo

a. The *internal auditory,*

b. The *poſterior* of the *dura mater,*

c. The *anterior ſpinal,*

d. The *poſterior ſpinal,*

4. *Superior intercoſtal.*

As ſoon as the trunk of the ſubclavian is gotten to the *axilla,* it is called *axillary artery* ; and in the arm *brachial.* The following are five branches of the axillary artery : viz.

1. The *external mamillary,*
2. The *inferior thoracic,*
3. The *external ſcapular,*
4. The *internal ſcapular,*
5. The *humeral.*

The *brachial artery,* after affording many collateral ramifications to the parts near it, is divided in the cubit,—but oftener where the axillary artery ends,—into two branches :

1. The *Cubital,*
2. The *Radial.*

The *Cubital Artery* ſends off five branches :

a. *Cubital recurrent,*

b. *External interoſſeal,*

c. *Internal interoſſeal,*

d. *Palmar arch,*

e. *Digital.*

The *Radial Artery* gives off the *Radial Recurrent* ; and having paſſed to the palm of the hand, it gives two *digital* branches, which

which, with many others, communicate with the branches of the cubital artery.

Three branches arise in the thorax from *the trunk of the descending aorta*:

1. The *Bronchial*,
2. The *Oesophageal*,
3. The *Inferior intercostals*.

There are eight branches from the *aorta* within the *abdomen*:

1. The *Coeliac*; from whence are
 - a. Two *Diaphragmatic* or *inferior phrenic*,
 - b. The *Coronary* of the Stomach,
 - c. The *Hepatic*: from which likewise is
   - a a. The *Pyloric*,
   - b b. The greater, or right *Gastric*; and from this comes
     - α. The *Duodenal*, and
     - β. The *right Gastro-ëpiploic*.
   - c c. The *Cystic*, or *Capsular*,
 - d. The *Splenic*. Hence are
   - a a. The *Pancreatic*, and
   - b b. The *less*, or *left Gastric*. From which are
     - α. The *left Gastro-ëpiploic*, and
     - β. The *middle Gastro-ëpiploic*.
   - c c. The *Short arteries*, and
   - d d. The *Epiploic*.

2. The *Superior mesenteric*, or *mesaraic*; of which the *superior* or *right Colic artery* is a branch.

3. The *Renal*, or *Emulgent*; from which come

a. The

a. The *Supra-renal*, and
b. The *Adipofe*.

4. The *Spermatic*.
5. The *Inferior mefenteric*: from whence is
   a. The *Left Colic*, and
   b. The *Internal Haemorrhoidal*.
6. The *Lumbar*.
7. The *Sacral*.
8. The *Iliac*: which are divided into
   a. *Internal*, and
   b. *External*.

The *Internal Iliac* has five branches:

1. The *Little Iliac*,
2. The *Gluteal*,
3. The *Ifchiatic*,
4. The *Common*, or *Internal Pudendal*: from which arife
   a. The *External Haemorrhoidal*,
   b. The *External Pudendal*.
5. The *Obturator*.

The *External Iliac* has two branches:

1. The *Epigaftric*, and
2. The *Small external Iliac*.

The trunk of the external iliac artery having paffed under Poupart's ligament, and gotten to the thigh, is called the *Crural Artery*; and this, in its courfe through the ham, becomes the *Poplitcal Artery*.

The *crural artery*, paffing through the thigh, gives many branches to the mufcles.

The *Poplitcal artery* is divided into two: of which one is called

1. The *Anterior Tibial Artery*, another
2. The *Pofterior Tibial Artery*.

From

From the latter of thefe arteries, is

a. The *Internal Tibial*,

b. The *Peroneal* or *Fibular*,

c. The *Internal* and *External Plantar*,

d. The *Plantal Arch*; which gives rife to the *Digital Arteries*.

Of the Pulmonary Artery and Veins, in general.

The *Pulmonary Artery* arifes from the heart, and is divided into two branches: the one is called

The *right pulmonary artery*, the other

The *left pulmonary artery*.

The *Pulmonary Veins* end in the heart by four branches.

Of the Venous Syftem in general.

1. *Four Pulmonary Veins.*
2. *Superior and Inferior Vena cava.*
3. *Vena Portae.*

Of the Vena Cava.

The *Vena Cava* is divided into *fuperior* and *inferior*.

The Branches of the Superior *Cava* are,

1. The *Right* and *Left Subclavian*: which receive many branches from the

a. *Mediaftinum*,

b. *Pericardium*,

c. *Thyroid Gland*,

d. *Thymus*: they alfo receive

e. The *Internal Thoracic Vein*,

f. The

f. The *Bronchial*, and
g. The *Superior Intercoſtals*.
2. The *External*, and
3. The *Internal Jugular* veins.

The *External Jugular* (297) vein receives the
1. *Frontal*,
2. *Angular*,
3. *Temporal*,
4. *Auricular*,
5. *Sublingual*, or *Ranine*, and
6. *Occipital*.

The *Internal Jugular* vein receives the blood from the
1. *Lateral Sinuſes* of the *dura mater*,
2. *Guttural*, or *Laryngeal* vein,
3. *Internal Maxillary*.

Theſe following are branches of the *Vena Azygos*:
1. The *Vertebral Veins*,
2. The *Inferior Intercoſtal*,
3. The *Bronchial*,
4. The *Pericardiac*,
5. The *Diaphragmatic*.

The *Subclavian Vein* takes the name of *axillary*, when it is come to the *axilla*:—It receives the

(297) In the arterial ſyſtem, it is a very general rule of Nature, to preſerve a certain proportion between the trunks and their branches: for when a trunk gives off branches, it is found to decreaſe in ſize; and when a branch gives off ramifications, it alſo decreaſes (See Note 287.). In the venous ſyſtem, this rule is not ſo general; the right jugular is twice as large as the *cava ſuperior*, and the left jugular is often twice as large as the left ſubclavian.

1. *Sca-*

1. *Scapular*,
2. *Superior* and *Inferior Thoracic*,
3. *Brachial*,
4. *Cephalic*,
5. *Basilic*,
6. *Median*,
7. *Salvatella*,
8. *Cephalic* of the thumb,
9. *Digital*.

The branches of the inferior *cava* are the

1. *Diaphragmatic*,
2. *Hepatic*,
3. *Renal*, from which come the
   a. *Capsular*,
   b. *Adipose*,
   c. *Left Spermatic*, from the *Left Renal*.
4. *Right Spermatic*,
5. *Lumbar*,
6. *Sacral*,
7. *Right* and *Left Iliac*; each of which receives
   a. The *Internal*, and
   b. The *External Iliac*.

Into the *Internal Iliac*, or *Hypogastric*, blood is conveyed by the following veins:

1. The *Obturator*,
2. The *Dorsal* of the Penis,
3. The *External Haemorrhoidal*,
4. The *Internal Pudendal*.

Into the *External Iliac* passes

1. The *Epigastric Vein*.

As the trunk of the external iliac artery, is called *femoral* or *crural*, when arrived at the thigh, so also is the *trunk of the external*

ternal iliac vein. And this vein continued in the ham is called, like the artery, *Popliteal.*

The *femoral* vein gradually receives

1. The *External Pudendal,*
2. The *Iſchiatic.*

The following ariſe from the *popliteal* vein:

1. *Anterior Tibial,*
2. *Poſterior* ——,
3. *Peroneal,*
4. *Sural,*
5. *Cephalic* of the great toe,
6. *Saphena,*
7. *Plantal,*
8. *Digital.*

Of the Vena Portae.

The *Vena Portae* is divided into two branches:

1. The *Ventral branch,*
2. The *Vena Portae Hepatica.*

Into the ventral branch are terminated,

1. The *Meſaraic,*
2. The *Splenic,*
3. The *Internal Haemorrhoidal.*

The *hepatic branch* is diſtributed to the whole ſubſtance of the Liver, in innumerable ramifications.

Of the Branches that ariſe from the Curvature of the Aorta.

The trunk of the Aorta, which ariſes from the left ventricle of the heart, has at its beginning *three ſemilunar valves,* by which the return of the blood into the ventricle is prevented.

vented. Having aſcended ſome inches, it is reflected backward from the left ſide, and forms *an arch*; it then deſcends, and is called *Deſcending Aorta* at the fourth *vertebra* of the back.

The *aorta*, thus begun at the left ventricle of the heart, gives off, before it paſſes the *pericardium*, the *two Coronary Arteries of the heart*:—theſe commonly ariſe from the trunk of the *aorta*, above the ſemilunar valves, ſeldom below them, that they may be covered by the valves.

The *Right Coronary* ariſes between the *aorta* and pulmonary artery.

The *Left Coronary* ariſes between the left auricle and the *Aorta*.—Both theſe arteries run upon the heart, and communicate with each other. They likewiſe ramify throughout the ſubſtance of the heart; and, at laſt, end in the coronary veins. Some branches go to the auricles and *pericardium*, and alſo to the coats of the *aorta* ([298]).

From

([298]) Winſlow ſays that there is ſometimes a third coronary artery, which ariſes from the *aorta* more backwards, and is ſpent on the poſterior or lower ſide of the heart (*Exp. Anat. Tom.* 2. *Sect.* IV. § 44.). See the note on the coronary veins (302.).

Boerhaave and others have believed and taught, that the coronary arteries are dilated while the other arteries of the body are contracted (*Inſt. Med.* § 183.). But Haller, who made numerous experiments, never ſaw the coronary arteries ariſing below the ſemilunar valves; ſo that the orifices of the coronary arteries cannot be cloſed by the ſemilunar valves while blood is propelled from the left

From the convex part of the curvature of the *aorta*, come *three principal branches.*

The *firſt*, on the right ſide, is called *arteria innominata*: it is ſoon divided into two large branches, the inferior of which, going off together with the principal trunk from the right ſide, arriſes at the clavicle, and becomes *the right ſubclavian* artery; the other branch, which aſcends by the larynx to the head, is called *the right carotid artery.*

The *ſecond branch*, which is middlemoſt, that comes from the curvature of the aorta, is called the *the left carotid.*

The *third branch* is ſituated more on the left ſide, and conſtitutes the *left ſubclavian*, which is always leſs than the right. The diviſion and beginning of theſe arteries is different in ſome ſubjects, but ſimilar deviations ſeldom occur.

Both *Carotid Arteries* aſcend almoſt directly on the ſides of the *aſpera arteria* as far as the ſuperior margin of the thyroid cartilage; connected, by cellular membrane, with the

ventricle into the *aorta*, as Boerhaave believed. And, if the orifices of the coronary arteries were within the reach of the ſemilunar valves, the valves themſelves, driven againſt the ſides of the *aorta*, would direct the blood in the beginning of the *aorta* into the coronary arteries, ſo that they would be dilated when the *aorta* itſelf is dilated. Boerhaave had other arguments to ſupport his opinion, derived from the retrograde angle of the coronary arteries coming from the *aorta*, and the paleneſs of the heart during its ſyſtole; but theſe can now-a-day need no ſerious confutation.

jugular

jugular veins, and eighth pair of nerves (209). Here each is divided into two principal branches; viz. *External carotid*, which is the anterior, and *Internal carotid*, or *cerebral artery*, which is the poſterior.

I.

The *External Carotid Artery* after it has left the thyroid cartilage and aſcended as high as the lower jaw, turns backwards to the articulation of the jaw, and is then called the *Internal Maxillary Artery*. In this courſe it gives off the following branches:

From its internal margin,

1. The *Thyroideal* or *Superior Laryngeal*, which is diſtributed to the thyroid gland, the muſcles of the larynx and *os hyoides*. It alſo ſends ſome ſmall ramifications to the jugular glands and ſkin of the neck.

2. The *Sublingual* or *Ranine Artery*, which ariſes ſomewhat above the thyroideal, is diſtributed to the ſubſtance, and muſcles of the tongue, and likewiſe to the ſublingual glands.

3. The *Inferior Maxillary Artery*. This goes to the parotid and ſublingual glands, to the palate and adjoining muſcles.

(209) It is of particular importance to remember the ſituation of this trunk, which is ſometimes ſo ſuperficial as eaſily to be felt and ſeen. In opening the jugular vein, and in the operation of tracheotomy, this artery is very liable to be wounded. It ſometimes paſſes the length of ſix or eight inches, without giving off a ſingle branch.

4. The *External Maxillary Artery.* It runs along the external ſurface of the lower jaw, over the *maſſeter* muſcle, to the ſides of the chin, where it is called the *Mental Artery.* This gives a branch, which dividing into two leſs ones, goes to the angles of the lips. The ſuperior of theſe branches follows the courſe of the orbicular muſcles on the upper lip, whilſt the inferior follows the courſe of the ſame muſcle on the under lip, even to the middle; where uniting with the correſponding branches of the oppoſite ſide, both are called the *Labial* arteries, or *Coronary* Arteries of the lips. The Mental Artery has no ſooner given off ſome ramifications to the muſcles of the chin, than it aſcends to the ſides of the noſe, where it again affords branches every way: having reached the internal angle of the eye, where it is called *Angular* artery, it proceeds and is loſt in the orbicular muſcle of the eye-brows and frontal muſcle.

5. The *Aſcending Pharyngeal.* This ariſes from the trunk of the external carotid poſteriorly, at its bifurcation; it gives branches to the *pharynx* and *fauces.* A branch likewiſe paſſes through the *foramen lacerum*, and goes to the *dura mater.*

From the external margin of the external carotid, come

1. The *Occipital Artery.* This ſends branches into the ſtyloid and digaſtric muſcles, and then paſſes between the ſtyloid and

and maſtoid apophyſes to the *extenſor* muſcles of the head. One branch of this artery goes through a *foramen* between the ſtyloid and maſtoid apophyſes, another branch immediately after, through the jugular *foramen*; and a third through the *foramen magnum* of the occipital bone, to the *dura mater*. This artery communicates alſo with the vertebral and cervical arteries.

2. The *Auricular* or *External Auditory*, which begins near to the occipital artery, goes to the external ear, to the *membrana tympani*, and temples.

The External Carotid Artery having given theſe branches, aſcends by the parotid gland, upon the zygomatic proceſs and temporal muſcle. It gives branches to the parotid gland and the face; and then becomes

The *Temporal Artery*; from which is given a branch to the frontal muſcle, and eye-brows, called the *Frontal Artery*.

The trunk of the external carotid paſſing backward to the lower jaw, ſends off the *Internal Maxillary* artery. This artery being a continuation of the trunk of the external carotid, and changing its name at the condyloid proceſs of the lower jaw, paſſes this proceſs; and after ſending ſome branches to the pterygoid muſcles, is divided into the three following:

Sphoeno-maxillary, which paſſes through a *foramen* in the temporal proceſs of the ſphenoid bone to the middle part of the brain.

 It

It disappears in the temples, the top of the head, and the *dura mater*.

The three following are the most remarkable of its branches:

The *first* as it passes through the fissure of the sphenoidal bone is distributed to the anterior surface of the *dura mater*; and is called the *Anterior* artery of the *dura mater*.

One branch passing through the orbital canal, sends branches into the pituitary sinus, and to the teeth of the upper jaw, under the name of *Superior alveolar* arteries.

Another goes to the face and eye-brows, and is called by some Anatomists the *Superior maxillary*.

The *second branch* of the internal maxillary artery passes through a canal in the lower jaw, and gives branches to the teeth and their sockets, called *inferior alveolar*. It passes out anteriorly through the *foramen* in the fore-part of the same canal, and communicates with the external maxillary artery, at this place.

The *third branch* of the internal maxillary artery goes through the spinous *foramen* of the sphenoid bone, and is distributed in the middle part of the *dura mater*, and is therefore called the *Middle artery* of the *dura mater*, or *Sphoeno-spinal* artery. A twig is said to run from this branch to the Aquaeduct of Fallopius, and another to the *cochlea*.

II. The

II.

The *Internal Carotid*, or *Cerebral Artery*, immediately at its origin from the principal trunk, paſſes backward, and aſcends in a ſerpentine direction, without giving off any branches, as high as the carotic *foramen*; then having paſſed through the carotic canal, it enters the *cranium*, but always in ſerpentine foldings, included in the *laminae* of the *dura mater*, and goes into the middle of the *cavernoſus ſinus* of the *ephippium*, and there gives off.

The *Ophthalmic*, or *Orbital Artery*. This artery after paſſing forwards and inwards under the optic nerve, enters the orbit, ſends branches into the lacrymal gland, and one ſmall branch to the noſe; then it gives off the *Ciliary Arteries*, which are diſtributed through the ciliary ligament, and choroid coat of the eye, and the *Central Artery of the Retina*; this latter ariſes either from the trunk of the ophthalmic artery itſelf, or from a branch of the ciliary arteries; it runs under the pulp of the optic nerve, enters the middle of the *tunica retina*, and is diſtributed like a net over the whole ſurface of this coat. From this artery come the veſſels of the *tunica hyaloidea*, and alſo the poſterior artery of the cryſtalline lens. The trunk of the internal carotid then paſſes in a curved line through the cavernous *ſinus*, and aſcends on the ſides of the *ephip-*

 pium

pium to its ſuperior proceſſes; it perforates the *dura mater*, is reflected backwards, and goes off in two principal branches, known by the name of the *anterior* and *poſterior cerebral arteries.*

The *Anterior Cerebral Artery* is united with its fellow coming from the oppoſite ſide; it paſſes upwards and backwards by the *columnae cerebri*, and ſends branches to the middle and poſterior part of the brain, and alſo to its third ventricle, its *fornix*, and the *thalami nervorum opticorum.*

The *Poſterior Cerebral Artery* paſſes through the *fiſſura Sylvii* to the ſides of the brain; it affords branches to the *plenus venoſus*, and is joined by a large branch to a branch of the vertebral arteries.

It is proper to remark, in this place, that the fabric not only of the tunics of the branches of the internal carotid, but alſo of the trunk itſelf is changed, at their entrance into the *cranium*, their coats being thinner and weaker than the coats of any other arteries in the whole body.

There are *Two Subclavian Arteries*, a *right* and *left*; the former ariſes from the *arteria innominata*, and the latter from the curvature of the *aorta.* They paſs behind the clavicle, and under it to the ſuperior margin of the firſt rib, where they terminate.

From each ſubclavian there ariſe the four following branches, viz.

I. The

I.

The *Internal Mammary Artery:* it ariſes from the anterior and inferior part of the ſubclavian, at the middle of the clavicle, it deſcends internally, along the ribs, to the *ſternum*, and it gives off the four following branches, viz.

1. The *Mediaſtinal Artery*, which is diſtributed to the *mediaſtinum.*

2. The *Thymal Artery,* which goes to the *thymus.*

3. The *Pericardiac Artery,* which goes to the *pericardium,* and afterwards to the diaphragm, from whence it is called, in that place, the *Superior Diaphragmatic Artery.*

4. The *Tracheal,* or *Inferior Guttural Artery,* which aſcends in a winding courſe, along the *aſpera arteria* to the thyroid gland and larynx; is often united to the laryngeal artery, and, for the moſt part, ſends off ſmall branches to the ſuperior part of the *ſcapula.*

Sometimes all theſe arteries ariſe, on the right ſide, from the very trunk of the right ſubclavian.

The Internal Mammary Artery ſends branches alſo to the *mammae* and intercoſtal muſcles, that are united with the external mammary artery. It then deſcends by the ſide of the xyphoid cartilage, goes out of the *thorax*, and ends in the *rectus abdominalis*

nalis muſcle, where it joins the epigaſtric artery [300]. Some of its branches alſo come into the other abdominal muſcles, and into the *peritonaeum*.

II.

The *Cervical*, or *Muſcular Artery of the Neck*; it ariſes ſuperiorly from the trunk of the ſubclavian artery, and is generally divided, at its origin, into an *anterior* and a *poſterior* branch.

The *Anterior Branch*, or *Anterior Cervical Artery*, runs behind the carotid artery, and is chiefly diſtributed to the muſcles that aſcend

[300] Boerhaave aſſigned the ſympathy between the *mammae* and the *uterus* to this union of the mammary and epigaſtric arteries (*Inſtit. Med.* § 666.): but phyſiologiſts have not been inclined to entertain the ſame opinion, for various reaſons. 1mo. The epigaſtric artery, which comes from the internal iliac, is no more connected with the arteries of the *uterus*, than the ſubclavian artery is with the trunk of the *aorta*. 2do. There is a conſent between other parts of the body, where there is no remarkable communication by arteries and veins. And, the communication of the mammary and epigaſtric arteries and veins is very ſmall. 3tio. It is unreaſonable to imagine that the blood of the epigaſtric artery ſhould paſs into the mammary arteries; or, that the blood of the mammary arteries ſhould paſs into the epigaſtric; for in the former caſe, the ſmall quantity of blood muſt overcome the reſiſtance of the blood contained in the mammary arteries, and moving in an oppoſite courſe; and in the latter, the blood of the mammary arteries muſt overcome the reſiſtance of that in the epigaſtric, moving in a contrary direction.

from the *ſternum* into the neck, and likewiſe to ſome muſcles of the neck, to the muſcles of the *pharynx*, and to the glands of the *larynx*.

Sometimes from this artery the Superior Intercoſtal ariſes.

The *Poſterior Branch*, or *Poſterior Cervical Artery* ariſes ſometimes alſo from the vertebral artery; it paſſes under the tranſverſe proceſs of the ſeventh *vertebra* of the neck to ſome muſcles of the neck and *ſcapula*, in which it diſappears. A branch of this is often joined to the occipital artery.

III.

The *Vertebral Arteries*, both of them, ariſe from the ſubclavian; but ſometimes the left, though ſeldom, ariſes from the arch of the *aorta*. Before they give off any branch, they paſs to the cervical *vertebrae*, and aſcend from thence through the *foramina* of their tranſverſe proceſſes, in ſuch a manner that they firſt enter the *foramen* of the ſixth *vertebra*, and afterwards paſs through the fifth, fourth, and third, in a ſerpentine direction. In this courſe, they give off branches to the muſcles of the neck, and the *involucra* of the ſpinal marrow. They proceed from thence through the *foramen* of the ſecond *vertebra* of the neck, obliquely upwards and outwards; paſs forwards and outwards between the tranſverſe proceſſes of the firſt and ſecond *vertebrae*

of

of the neck; make a large curvature poſteriorly, and go through the *foramen* of the firſt cervical *vertebra:* in this place, they ſurround a furrow, in the tranſverſe proceſs, of the *vertebra* laſt mentioned, and then perforate the *dura mater*, and enter the *cranium* through the *foramen magnum occipitale*; they aſcend with the *medulla oblongata*, and unite there, at a very acute angle, into one common trunk, called the *Baſilary Artery.* This Artery, which ſome call the *Cervical*, afterwards perforates the *dura mater*, under the *pons Varolii*, and ſends branches that unite, here and there, with the branches of the carotids, into the *medulla oblongata*, *cerebrum*, and *cerebellum*. Other branches of this artery, that deſerve to be noticed, are

1. The *Internal Auditory Artery*, which paſſes with the ſeventh pair of nerves to the internal parts of the ear:

2. The *Poſterior Artery of the Dura Mater*, which is diſperſed through the poſterior part of the *dura mater*.

3. The *Anterior* and *Poſterior Spinal Arteries:* theſe ariſe not from the baſilary artery, but from the vertebral arteries. For each of the vertebral arteries gives off a branch, at its entrance into the *cranium:* theſe branches immediately come together into one common trunk, which deſcends poſteriorly in the courſe of the *medulla ſpinalis*, and is called the *poſterior ſpinal artery*. A little higher than this, each of the vertebral arteries ſends off a ſimilar

milar branch, which alſo unites with its fellow, and forms one common trunk, that deſcends anteriorly with the ſpinal marrow, and is of conſequence called the *anterior ſpinal artery*. Both ſpinal arteries are united, in the ſpinal marrow, with ſome branches of the incoſtal artery.

It remains now to be obſerved of the fabric of the vertebral arteries, as it was before obſerved of the carotids, that their coats become more delicate, at their ingreſs into the *cranium*.

IV.

The *Superior Intercoſtal Artery* ariſes from the ſubclavian, but ſometimes alſo from the trunk of the cervical arteries. It runs on the internal ſurface of the three, or four, ſuperior, true ribs, near their heads; it gives a branch to each rib, which paſſes forwards at the inferior margin, and it immerges as well into the intercoſtal muſcles as the *pleura*. Small branches go through the lateral *foramina* to the ſpinal marrow.

When the trunk of the ſubclavian artery paſſes, above the firſt rib, over the *ſcaleni* muſcles of the neck, from the cavity of the *thorax*, it is called the *Axillary Artery*. From the axillary artery there ariſe the following branches, viz.

1. The *Thoracic*, or *External Mammary Artery*, which gives branches to the *mammae*, and

and muſcles placed on the breaſt. One branch runs downwards, between the *pectoralis major* muſcle and the deltoid near the *vena cephalica* of the arm, in the direction of the *humerus.*

2. The *Inferior Thoracic Artery*, which is diſtributed to the muſcles of the *ſcapula* and back.

3. The *External* and *Internal Scapular Artery:* the *external* lies in the hollow of the ſuperior margin of the *ſcapula*; it is diſtributed through the muſcles of the *ſcapula*, and about the articulation of the *humerus:* the *internal* ſends branches not only into the muſcles, but alſo into the glands of the armpit.

4. The *Humeral Artery:* it ariſes ſometimes from the brachial artery; it is diſtributed to the muſcles of the *ſcapula* and *humerus.*

Having given off theſe branches, the axillary artery emerges under the tendon of the *pectoralis major* muſcle, and is then called the *Brachial Artery.*

The *Brachial Artery* is ſometimes divided into two, at its origin, but it generally deſcends in only one trunk, on the inſide of the arm, above the coracoid muſcle of the *humerus*, and the *anconaeus* muſcle, at the inner margin of the *biceps* muſcle, behind the *vena baſilica*, to the condyles of the *os humeri.* From the arm-pit to the middle of the *os humeri*, it is covered only by the common integuments; but

but it afterwards immerges deep into the muſcles, and, in this courſe, it encreaſes the number of arteries in the neighbouring muſcles, and in the *os humeri* itſelf. It is divided generally into two large branches, between the inferior condyles of the *os humeri*, after having given off numerous branches to the contiguous muſcles, and to the articulation of the *humerus*, under the name of *Collateral Arteries.* One branch of the brachial artery is called *Cubital*, the other is called *Radial.*

The *Cubital*, or *Ulnar Artery* paſſes between the *pronator rotundus*, the *radiaeus internus*, the *palmaris longus*, and the *flexor* muſcles of the fingers, and the *ulna*, in the direction of the *cubitaeus internus* muſcle, as far as the wriſt, in which courſe, it gives off the following branches, viz.

1. The *Cubital Recurrent Artery*, which runs backwards to the internal condyle of the *humerus*; it is diſtributed to the articulation, and it communicates with the lateral branches of the brachial artery.

2. Some ſmall branches that are immerſed in the contiguous muſcles.

3. The *External Inter-oſſeal Artery*, which ariſes about three fingers breadth under the articulation, perforates the inter-oſſeal ligament, immediately at its beginning, runs in the direction of this ligament, and on its external ſurface to the anterior extremity of the fore-arm, where it unites to a branch of the internal inter-oſſeal artery. But at laſt it

is

is loſt in the external inter-oſſeal muſcles of the hand. There go likewiſe from this two large branches to the muſcles of the fore-arm.

4. The *Internal Inter-oſſeal Artery:* it ariſes immediately under the former, and goes along the inſide of the inter-oſſeal ligament downwards to the *pronator quadratus* muſcle; at which place, it perforates the ligament, and after being united to branches of the external inter-oſſeal, and radial artery, it is diſtributed on the outſide of the wriſt and back of the hand. Beſides, it gives off a particular branch, that perforates the internal ligament of the wriſt, and is expanded on the inſide of the wriſt.

The Cubital Artery, after giving off theſe branches, mounts the internal ligament of the *carpus*, and enters the palm of the hand on the ſide of the *os piſiforme.* In this courſe, it gives off branches to contiguous muſcles, and to the ſkin; of which branches one paſſes between the third and fourth metacarpal bone, and is joined, on the back of the hand, with the external inter-oſſeal artery. From the *os piſiforme* towards the thumb, the cubital artery makes a curve, which is called the *Palmar Arch.*

The *Palmar Arch* has ariſing from its convex ſide three or four arteries, which run to the anterior extremities of the metacarpal bones; at this place, each of them is divided into two branches, which run on the ſides of

of the fingers, even to their tips; but in order, from the ſide of the little finger to the outſide of the fore finger, where they are joined, and take the name of *Digital Arteries.*

From the concave ſide of the palmar arch, there ariſes one branch, which is united, at the thumb, with a branch of the radial artery. There ariſe alſo from hence two digital arteries, not yet mentioned, which paſs along the inſide of the fore finger, and the oppoſite ſide of the thumb.

The *Radiaeal*, or *Radial Artery* ariſes ſometimes, though rarely, from the cubital artery, above the bend of the cubit; it then gives off the *Radiaeal Recurrent Artery*, which returns to the bend of the cubit, where it joins with lateral branches of the brachial artery, and diſappears in the neighbouring muſcles. The Radiaeal Artery then deſcends between the *ſupinator longus* muſcle and the *radius* even to its extremity, and gives off, in this courſe, numerous branches to the contiguous muſcles. When it goes inferiorly along the wriſt, it lies under the ſkin, and immediately on the bone, ſo that the pulſations which it makes may be eaſily perceived by the finger. It is at this place that we feel the pulſe. It ſometimes enters ſuperiorly into the palm of the hand, between the fore-finger and the thumb; but it is ſometimes turned rather backwards, and then the pulſe cannot be felt at the wriſt. But the courſe of this artery is ſcarcely

ever alike in both arms. It generally enters the palm of the hand, by the inside of the thumb, and it gives numerous branches to the neighbouring parts; the chief of which communicates with a branch of the palmar arch, and constitutes the two *Digital Arteries*, of which one runs on the inside of the fore-finger, the other on the opposite side of the thumb, to the tip of each; at which place they are joined to the digital artery coming from the opposite side.

The Branches of the Aorta Descendens.

The *Aorta Descendens* begins from the end of the curvature of the *aorta*, near the fourth *vertebra* of the *thorax*; from hence it descends, on the left side of the other *vertebrae*, to the last *vertebra* of the loins; where it is divided into two branches, which are called the *Iliac Arteries*. In this course, before the *aorta* comes to the diaphragm, it gives off the four following branches, viz.

1. The *Bronchial Arteries:* these are distributed through the vessicles of the lungs, and the branches of the *aspera arteria*. They are destined to nourish the lungs. They arise sometimes, by a single branch, from the *aorta*, which is afterwards divided into two; but they sometimes arise from the superior intercostal artery.

2. The *Oesophagacal Arteries* are generally two or three, but sometimes there is only one. They

They are diſtributed through the *oeſophagus* and its glands.

3. The *Inferior Intercoſtal Arteries:* eight of theſe ariſe, on each ſide, from the *aorta*, and run internally along the inferior margin of each rib, to its middle; each of them then divides into an external and an internal branch; the external going to the *thorax* and external intercoſtal muſcles, and the internal going to the *pleura* and internal intercoſtal muſcles. At their origin, poſteriorly, each of them ſends branches into the coats of the *medulla ſpinalis* and muſcles of the back. From the inferior, ſome branches go into the diaphragm.

All the intercoſtal arteries that run on the right ſide, immediately at their origin, paſs tranſverſely under the *vena azygos*.

4. The *Inferior Diaphragmatic*, or *Phrenic Arteries:* theſe are divided into the right and left. The *Right* ariſes ſometimes from the coeliac artery. They are both diſtributed by numerous branches over the inferior ſurface of the diaphragm.

In the *Abdomen*, the trunk of the deſcending *aorta* gives off the eight following branches, viz.

I. The *Coeliac Artery:* this, as was obſerved, affords the right inferior diaphragmatic artery, and then paſſes into the three following large branches, viz.

a. The *Coronary Artery of the Stomach*, which ſurrounds the left orifice of the ſto-

mach, like a crown, and ſends its branches into the ſuperior and inferior ſurface of the right ſide of the ſtomach. One branch goes from it into the liver.

b. The *Hepatic Artery*, which is the largeſt branch of the coeliac artery, ariſing from its right ſide, and immediately giving off the three following branches, viz.

α. The *Pyloric Artery*, which is diſperſed through the *pylorus*, and joined to the coronary artery of the ſtomach.

β. The *Right*, or *Large Gaſtric Artery*, which ſends a branch, at its origin, into the *duodenum*, called the *Duodenal Artery*, and then goes along the right ſide of the ſtomach, in the direction of its large arch, and gives branches to the *omentum*, which are called the *Right Gaſtro-epiploic Arteries*. This Artery is frequently joined to the other arteries of the ſtomach. The trunk of the hepatic artery paſſes near the *vena portae* to the fiſſure of the liver, and there ſends out the Cyſtic Arteries.

γ. The *Cyſtic Arteries* being ſent out, the hepatic artery is laſtly diſtributed, together with the branches of the *vena portae*, by innumerable ramifications through the whole ſubſtance of the liver.

c. The *Splenic Artery* is the third branch of the coeliac. It comes, on the left ſide, from the coeliac artery, under the ſtomach and *pancreas*, and goes to the ſpleen, and is diſtributed through its ſubſtance, by four

or

or five branches. In its course it gives off the following, viz.

α. The *Pancreatic Artery*, which is distributed through the *pancreas*.

β. The *Left*, or *Small Gastric Artery*, which is dispersed on the left side of the stomach, in the direction of its larger arch; sends into the *omentum* the *Left Gastro-epiploic Arteries*, and is lastly united to the right gastric artery, from which union the *Middle Gastro-epiploic arteries* arise.

γ. The *Short Arteries*, which are distributed through the left extremity of the stomach.

δ. The *Omental*, or *Epiploic Artery*, which also runs to the *omentum*.

II. The *Superior Mesenteric Artery* is another branch of the *aorta* descending in the *abdomen*; it runs between the *laminae* of the mesentery, and gives off numerous branches to the *jejunum*, *ileon*, and *coecum*. It sends a particular branch to *colon*, called the *Right* or *Superior Colic Artery*.

III. The *Renal*, or *Emulgent Arteries* come laterally from the *aorta*. They are two, of which one goes transversely to the right kidney, and the other to the left. But before they are inserted into the concave margin of the kidneys, they give off the *Supra-renal* and *Adipose Arteries of the kidneys*.

We must observe, concerning these arteries, that the right renal artery is longer than the left, because the *Aorta* descends on the left side of the spine,

ſpine. The renal arteries alſo run under the *vena cava.*

IV. The *Spermatic Arteries.* One ariſes, on each ſide, above, but generally below the renal arteries, from the *aorta.* Sometimes the left ſpermatic artery comes from the renal artery; and each of them deſcends outwards, on its own ſide, before the *pſoas* muſcle, giving branches, in its courſe, to the neighbouring parts. A conſiderable branch goes into the fat of the kidneys. All the branches deſcend, in a ſerpentine direction, behind the *peritonaeum,* to the abdominal ring; at which place, they are both joined with the ſpermatic vein of the ſame ſide, the ſpermatic duct, and a quantity of cellular membrane, ſo as to form the *Spermatic Cord,* as it is called. Each of them goes to the teſticles, through the groin, and having perforated the *tunica albuginea,* is diſtributed throughout the ſubſtance of the teſticle, in ſerpentine convolutions ([301]). In women, theſe arteries enter the *ovaria* and Fallopian Tubes.

V. The *Inferior Meſenteric Artery,* immediately at its origin, goes off into two branches, but ſometimes into more.

a. The firſt branch goes to the left ſide of the *colon,* under the name of the *left* or *inferior colic Artery*; and is diſtributed through

([301]) This artery is deſcribed in the deſcription of the teſticles.

the

the *Colon*, and united the right colic Artery.

b. The ſecond branch, or the *Internal Haemorrhoidal* is diſtributed through the *inteſtinum rectum*.

VI. The *Lumbar Arteries* ariſe, five or ſix on each ſide; the ſuperior go to the diaphragm and lowermoſt intercoſtal muſcles, and the inferior are diſtributed through the lumbar and abdominal muſcles. Where they perforate the abdominal muſcles, they are called *External Hypogaſtric Arteries.* Some branches likewiſe run to the ſpinal marrow and its coats.

VII. The *Sacral Arteries:* they ariſe ſometimes by a ſimple trunk, and ſometimes by a double, triple, or quadruple trunk, from the *aorta*. They are diſtributed in the direction of the *os ſacrum*, and ſend ſome branches inwards to the *cauda equina*.

VIII. The trunk of the *aorta* is laſtly divided, at the lowermoſt *vertebra* of the back, into two large branches, called the *Iliac Arteries*.

The Iliac Arteries, and their Branches.

The *Iliac Arteries*, about two or three fingers breadth from their origin, are divided into two, viz. the *Internal* and the *External Iliac Artery*.

The *Internal Iliac*, or *Hypogaſtric Artery* is turned forwards from behind, and forms the following branches, viz.

 1. In-

1. In a *foetus*, the *Umbilical Arteries*, which aſcend above the *peritonaeum*, from the ſides of the urinary bladder, perforate the *umbilicus*, and then paſs to the *placenta*, to carry blood from the *foetus* into the *uterus*. In adults, theſe arteries become ligaments.

2. The *Little Iliac*, or *Small Internal Artery*, which ariſes from the poſterior ſide of the internal iliac artery, and ſends branches into the *os ſacrum*, the *pſoas magnus*, *iliacus internus* muſcles, and alſo to the *oſſa ilii*.

3. The *Gluteal Artery*, which is larger than the former, goes out of the *pelvis*, with the iſchiatic nerves, through the iſchiatic notch; paſſes, in its courſe, into the muſcles of the *anus*, the *rectum*, and the urinary bladder, and is laſtly diſtributed to the gluteal muſcles.

4. The *Iſchiatic Artery:* this ſends branches to the *os ſacrum* and *os iſchii*; it goes out at the ſame notch as the former, and it is diſtributed among the *glutei* muſcles, the articulation of the *femur*, and the *perioſteum* of the *os iſchii*.

The *Common Pudendal Artery*, immediately at its origin, paſſes into two branches:

The *Anterior* paſſes between the urinary bladder and the *rectum*, under the *ſymphyſis* of the pubis; *in men*, it runs along the back of the *penis*, and is inſerted into the *corpora ſpongioſa*, under the name of the *External Pudendal Artery*. In the hollow of the *pelvis*, it gives branches to the *veſiculae ſeminales*, the neck of the urinary bladder, and the

proſtate

proſtate gland: *in women*, it is diſtributed through the ſides of the *uterus*, where it communicates with the ſpermatic and hypogaſtric arteries, from which latter it often ariſes.

The *Poſterior Branch* of the common pudendal artery paſſes out of the *pelvis*, through the iſchiatic notch, and is diſtributed through the *ſphincter ani* under the name of *External Haemorrhoidal Artery*. Some branches paſs into the *corpora ſpongioſa penis* and *urethrae*.

The *Obturator Artery* paſſes with the ſmall crural nerve through the *foramen ovale*, and is diſtributed among the *obturator*, and other adjacent muſcles. It ſends ſome branches into the inguinal glands and the ſkin.

The *External Iliac Artery* paſſes to Poupart's ligament, and there gives off two branches, the inner of which is called the *Epigaſtric Artery*: this paſſes ſomewhat obliquely under the *tranſverſus abdominis* and *rectus* muſcles, and above them ſuperiorly, giving branches to them, and joining ſuperiorly with the internal mammary artery.

The *External* branch is called the *Small External Iliac Artery*; it is diſtributed among the *oſſa ilei* and the *obliqui abdominis* muſcles.

The trunk of the *External Iliac Artery* afterwards goes out of the *pelvis*, under Poupart's ligament, under the name of the *Crural*, or *Femoral Artery*; it is covered, on the fore and inner part of the thigh, only by ſkin, but inferiorly by muſcles; and it deſcends to the

the ham, through the *triceps femoris* muſcle, where it is called the *Popliteal Artery*.

In this courſe, it gives off various branches, of which

The two or three firſt go under the ſkin of the *regio pubis* and inguinal glands: then more come from theſe, which are diſtributed through all the muſcles of the thigh. Laſtly, lateral branches go off to unite to the recurrent arteries of the *tibia*. It muſt be obſerved, in this place, that the femoral artery, immediately under Poupart's ligament, is ſometimes divided into two branches, the ſmaller of which aſcends on the outſide of the thigh, between the *rectus* and *cruraeus* muſcles, and the larger paſſes on the inſide as far as the ham, and conſtitutes the Popliteal Artery.

The *Poplitcal Artery* ſends ſome branches into the ham and the adjacent muſcles. It is bifurcated about two fingers breadth below the ham, into the *Anterior* and *Poſterior Tibial Artery*.

The *Anterior Tibial Artery* ſuperiorly perforates the interoſſeal ligament, aſcends upon it, and deſcends forwards to the back of the bottom of the foot; giving off branches, in this courſe, that unite with the lateral branches of the popliteal artery, and others that unite with the poſterior tibial artery, and the peroneal, or fibular artery, diſperſed every way through the adjacent parts.

When it is gone upon the back of the foot,

near the great-toe, it perforates the muſcles ſituated there between the *oſſa metatarſi:* it is then joined in the ſole of the foot with the poſterior tibial artery, forming by this mechaniſm the *Plantar Arch.* The other branches are diſtributed through the muſcles of the *metatarſus.*

The *Poſterior Tibial Artery* again divides into two branches, the inner of which is called properly the *Poſterior Tibial Artery,* or the *Great Fibial Artery*; and the outer the *Peroneal,* or *Fibular Artery.*

The *Great Sural Artery* deſcends on the inner and poſterior ſide of the *tibia,* and, beſides various branches going into the adjacent parts, it ſends a branch into the ſuperior part of the *tibia,* which goes into its ſubſtance. It then goes behind the internal ancle to the ſole of the foot, where likewiſe it divides into two branches, known by the names of the *External* and *Internal Plantar Arteries.*

The *External Plantar Artery* is united, as already obſerved, with a branch of the anterior tibial artery, forming the plantar arch. From the convex part of this arch ariſe the *Digital Arteries* of the feet. From the concave part branches ariſe that go into the muſcles of the ſole of the foot.

The *Internal Plantar Artery* divides in the middle of the ſole of the foot: one branch being joined with ſome branches of the anterior tibial artery, and paſſing to the great toe;

toe; the other being diſtributed among the phalanxes of the other toes, and there united with branches of the plantar arteries.

The *Peroneal Artery* deſcends on the poſterior ſide of the *fibula*: it perforates the interoſſeal ligament at the inferior extremity of the *fibula*; it emerges on the back of the foot, and is diſtributed in branches upon it. It is alſo joined poſteriorly to the *tibialis antica* and *poſtica*.

The Pulmonary Arteries and Veins.

The *Pulmonary Artery* ariſes from the anterior or right ventricle of the heart, as the *aorta* ariſes from the left. It has three valves, of a ſemilunar ſhape, like the *aorta*, but ſomewhat ſmaller, and weaker, nor always poſſeſſed of tubercles. It paſſes to the lungs, and immediately divides into two branches; the right of which goes under the arch of the *aorta* to the right lung, and the left to the left lung. Both theſe branches are diſtributed by innumerable branches through the ſubſtance of the lungs, ſurrounding the veſicles like a net-work, and ending in the pulmonary veins.

The *Pulmonary Veins* ariſe by innumerable ſmall beginnings from the ends of the pulmonary artery; moſt of them uniting commonly into four trunks, which evacuate themſelves within the *pericardium*, into the left or poſterior *ſinus* of the heart. It remains to be obſerved

obſerved that they are leſs than the arteries; and that they have no valves.

The Vena Cava.

The *Vena Cava* is divided into *Superior* and *Inferior*, both uniting within the *pericardium*, and being expanded there into a ſac poſſeſſed of numerous muſcular fibres, which is called the right or anterior *ſinus* of the heart. Where the *vena cava inferior* ends in the *ſinus*, there is a membranous valve, of a ſemilunar form, ſeparating the *ſinus* from the *cava*, called, from its inventor's name, *Valvula Euſtachii* ([302]).

The

([302]) The coronary veins of the heart are not deſcribed by many anatomiſts in their hiſtory of the veins, becauſe they are not immediately joined to any other vein (Winſlow, *Exp. Anat. Tom.* 2. *Sect.* V. § 17.). The exterior courſe of the coronary veins is much the ſame as that of the arteries; but they end partly in the right auricle, and partly in the right ventricle. Their trunk opens chiefly into the right auricle by an orifice that is covered with a valve commonly called *Semilunar*, but more truly *Annular*, *Oblong*, and *Narrow*. This valve was known to Galen and Euſtachius; but C. F. Wolf was the firſt who taught that its figure is not ſemilunar, but oblong: he ſays it is thin, pellucid, and perforated with numerous ſmall holes; that it is a valve *ſui generis*, and unlike any other in the body. The ſituation of the orifice of this large coronary vein is, according to C. F. Wolf, between the two large openings into the right *ſinus*, between the opening of the *vena cava inferior*, and the venous opening of the right ventricle, and that part of it in particular to which the valve of the *ſeptum* anſwers. So that, in the adult, the *Valvula Euſtachii* adheres by its anterior extremity

The *Cava Superior* receives all the blood returning from the head, neck, thorax, and ſuperior extremities.

The *Cava Inferior* receives all the blood returning from the *abdomen* and inferior extremities.

The Veins of the Head.

All the blood of the head, face and neck is emptied into the two *Internal* and two *External Jugular Veins.*

The *Internal Jugular Veins* ariſe from the *foramen lacerum* on each ſide: they receive all the blood from the brain and *cerebellum*, returned from the two lateral ſinuſes into the *ſinus* of the *dura mater:* they deſcend in the neck, over the carotid arteries, and receive in this courſe,

The *Guttural* or *Thyroideal* and the *Internal Maxillary Veins:* they evacuate themſelves below theſe into the ſubclavian veins.

The *External Jugular Veins* ariſe from a conflux of the branches

Of the *Frontal,*

mity to the common opening. The uſe of this valve is clearly to prevent the return of blood into the coronary vein: and the ſituation of the proper orifice being contrary to the common orifice, is another mean of preventing the return of the blood: for if blood ſhould happen to paſs into the *ſacculus*, under the valve through the common orifice, it cannot be impelled with all its force into the coronary vein and its proper orifice; but rather into the bottom of the *ſacculus*; where its *impetus* being conſiderably leſſened, it cannot much affect the proper orifice (*Comment. de Reb. &c. Lipſiac, Vol.* 29. *p.* 399.).

Of

Of the *Angular*,
——— *Temporal*,
——— *Auricular*,
——— *Ranine*, or *Sublingual*, and
——— *Occipital vein*: they deſcend, on each ſide of the neck, immediately under the integuments; and they return the blood brought back from theſe parts to the ſubclavian veins.

The Veins of the Upper Extremities.

The *Digital Veins* empty their blood into

1. The *Cephalic Vein of the Thumb*, which runs on the back of the hand along the thumb, and empties its blood into the external radial vein.

2. The *Vena Salvatella*, which returns along the little finger, is united with the former, and empties its blood into the *Internal* and *External Cubital Veins*.

1. The *Vena Cephalica Major*,
2. Into the *Vena Baſilica*, and
3. Into the *Vena Mediana*.

The *Vena Cephalica Major* is ſituated on the ſuperior part of the fore-arm; and ariſes from the union of the *radialis externa* and the *mediana cephalica minor*.

The *Vena baſilica* aſcends on the under ſide of the *humerus*, and ariſes from the conflux of 1. The external and internal cubital veins; 2. The *Venae Satellitum*, which accompany the brachial artery as far as the bend of the cubit, and are diſtributed on both ſides in the adjacent muſcles, and 3. The *Vena Superior Profunda*.

The

The *Median Vein* is ſituated in the middle of the fore-arm, and ariſes from the union of 1. The *Vena Cephalica Mediana Major*; 2. The *Vena Profunda Inferior*; and 3. The *Internal Radial Vein:* it aſcends into the bend of the cubit, and is there joined to the *Vena Cephalica Magna*, and *Vena Baſilica*.

All the Veins already mentioned unite into one in the ſhoulder, called

The *Brachial Vein:* this aſcends on the inſide of the ſhoulder as high as the *axilla*, and it changes its name as it enters it, and is called

The *Axillary Vein:* this receives the ſuperior and inferior thoracic vein, the *vena muſcularis*, and the internal and external ſcapular veins. When it comes under the clavicle, it is called the Subclavian Vein.

Into the ſubclavian veins are emptied

1. The External Jugular Vein,

2. The Internal Jugular Vein,

3. The Vertebral Vein, that receives the cervical and the vertebral ſinuſes.

4. Before the ſubclavian veins end in the *vena cava*, the following veins empty themſelves into them, *viz.*

The Mediaſtinal,
The Pericardiac,
The Diaphragmatic, or Phrenic,
The Thymic,
The Internal Mammary,
The Laryngeal, and ſometimes
The Superior Intercoſtal.

Both ſubclavians unite, on the right ſide into one trunk, in the cavity of the thorax.

This

This trunk is called *Vena Cava Superior*, or *Descendens*. After receiving the *Vena Azygos*, it descends, and, as was before observed, empties itself into the right *sinus* of the heart.

The *Vena Azygos* is formed by the following branches; *viz.*

1. The Bronchial,
2. The *Oesophageae Superiores dextrae*,
3. The *Vertebrales*,
4. The *Intercostales Dextrae Superiores*,
5. ———————————— et *Sinistrae Inferiores*.

The Veins of the Inferior Extremities.

The *Digital Veins:* these arise on the tips of the toes, and empty themselves into

1. The *Cephalic Vein* of the great toe, which runs along this toe, over the internal ancle.
2. The *Vena Saphena*, which ascends along the little toe over the external ancle, and into
3. The *Vena Dorsalis Pedis*.

These three veins coming together, form the *Anterior Tibial Vein*, which, being united to the posterior tibial vein inferiorly, ascends forwards, and perforates the inter-osseal ligament.

The *Posterior Tibial Vein* receives inferiorly the plantar veins, and superiorly the sural vein.

The *Peroneal Vein* ascends, in the direction of the *fibula*, behind the external ancle. Before it comes to the ham, it unites, with the

former two, into one trunk, which is called the *Subpopliteal Vein.*

The Subpopliteal Vein aſcends through the ham; and, as it goes from it, is called

The *Crural,* or *Femoral Vein.*

The crural vein aſcends further over the anterior ſurface of the thigh to Poupart's ligament; enters the *pelvis* through it, and is there called

The *External Iliac Vein*; this receives the external pudendal veins returning from the inguinal glands; and it comes into one trunk with the internal iliac, forming with it the *vena cava inferior*, or *aſcendens.*

The *Vena Cava Inferior* ariſes from the iliac veins at the laſt *vertebra* of the loins, it aſcends on the right ſide of the ſpine, enters the *thorax* through the right *foramen* of the diaphragm, and is united, near the heart, with the *vena cava ſuperior*, forming the anterior *ſinus* of the heart.

Beſides the iliac veins in the hollow of the *pelvis*, it receives the following branches, *viz.*

1. The Sacral Veins,
2. The Lumbar —,
3. The Right Spermatic —,
4. The Renal —,
5. The Hepatic, in the cavity of the *thorax.*
6. The Diaphragmatic, or Inferior Phrenic.

The *Internal Iliac Vein* receives

1. The External Haemorrhoidal veins, returning from the *anus*; and

2. The

2. The Hypogaſtric Veins; into which latter flow

1. The Internal Pudendal Veins,

2. The *Pudenda Dorſalis Penis*, and

3. The *Obturatoria*, returning with other veins, from the adjacent parts.

The Vena Portae, and its Branches.

The *Vena Portae* is that large vein, which returns blood from the inteſtines, ſpleen, and ſtomach, to the liver: it is diſtributed in numerous branches through the liver, like an artery. The Blood, which it carries, is deſtined for the formation of bile: the remaining blood is brought by branches into the trunk of the *cava*.

The trunk of the *vena portae* is divided into two branches: the *Superior*, which is diſperſed through the liver, is called the *Vena Portae Hepatica*: the *Inferior* is called *Vena Portae Ventralis*.

The *Vena Portae Ventralis* ariſes from the union of the three following principal branches:

I.

The *Splenic Vein*, which having ariſen by an oblique courſe from the ſpleen, enters the fiſſure of the liver, on the right ſide, and receives in this courſe, the following branches:

1. The *Coronary vein* of the ſtomach,

2. The *Pancreatic vein*, and
3. The *Gaſtric*, or *Left Gaſtro-epiploic*.

II.

The *Meſenteric Vein*; which receives
1. The *Right* and *Left Colic Vein*, which is united to ſmall branches of the internal Haemorrhoidal; and
2. The *Gaſtro-colic*, into which the *gaſtro-epiploica dextra* empties itſelf.

III.

The *Internal Haemorrhoidal Vein*: it ariſes from branches that return from the *anus*, and *rectum*, and alſo from the meſocolon. It is alſo enlarged by branches returning from the greater meſenteric vein, and from the *Right* and *Left gaſtro-epiploic vein*.

The three principal branches now mentioned come together into one trunk; which is united to the trunk of the hepatic vein diſtributed through the liver: and by the union of theſe three is formed the *Vena Portae*.

Of the Circulation of the Blood in a foetus.

In a child, as ſoon as it is born, and in every adult, we know the circulation of the blood to be performed in the following manner.

The Blood, by the contraction of the right ventricle of the heart, is driven into the pulmonary artery: and this is again contracted after its expanſion: and as the blood cannot re-turn

turn into the heart, becauſe of the ſemilunar valves before mentioned, placed at the beginning of the pulmonary artery; and becauſe of the pulmonary artery being cloſed by the valves, the blood is propelled into the extreme ends of the pulmonary artery, through the whole lungs. It is then received by the ends of the pulmonary veins, and carried back into the left, or poſterior ventricle of the heart. The left ventricle, upon receiving this maſs of blood, is immediately contracted, and, contracting like the right ventricle, forces the blood into the *aorta*. The *aorta* itſelf is then contracted, and drives the blood contained in it into all the *viſcera*, and every part of the body, through the extremities of the arteries; in which parts, according to the different fabric of the part, various liquors are ſeparated from the blood. The blood that remains after the nouriſhment of parts, and ſecretion, is received by very ſmall veins, and paſſes from them into larger, and, laſtly, into the *vena cava ſuperior* and *inferior*, which again returns all the blood to the right ventricle, from which it was before expelled. Such is the circulation of the blood in adults, and in children as ſoon as they are born.

But in a *foetus*, or an *embryo*, the courſe of the blood is far different: for the *foetus* receives its blood from the mother by means of the umbilical vein, and returns it to the mother through the umbilical arteries contained in the umbilical cord.

The *Umbilical Cord* is compoſed of the umbilical vein, and two umbilical arteries.

The *Umbilical Vein* ariſes from the conflux of the veins of the *placenta uterina*, which receive their blood from the ends of the arteries of the *uterus*; and it then goes through the navel with the umbilical cord, aſcends over the *peritonaeum* to the liver, and is there emptied into the *ſinus* of the *vena portae*. From this *ſinus* the *Canalis Venoſus*, as it is called, carries the blood to the *vena cava* which aſcends behind the liver; by means of which the blood is carried onwards to the heart. This blood is then immediately forced from the right into the left auricle, through the *foramen ovale*: and the remaining blood is carried into the right ventricle, from which it paſſes into the pulmonary artery, but in very ſmall quantity through the lungs; for the greater part paſſes into the cavity of the *aorta*, through the *Canalis Arterioſus Botalli*, which ariſes from the pulmonary artery, and is inſerted obliquely into the trunk of the *aorta*.

From the *aorta* the blood paſſes, as in the adult, into every part of the body; and thus it is propelled into the umbilical arteries before mentioned. The umbilical arteries ariſe from the internal iliac arteries, aſcend near the bladder to the navel, and go through it, with the umbilical cord, to the *placenta*, in which their ends are joined with the very ſmall veins of the *uterus*, and thus their blood is poured into the veins.

THE

DOCTRINE

OF THE

LYMPHATIC VESSELS.

BY the term *Lymphatic Veſſels* is underſtood ſmall, tranſparent veins, which return from various parts of the body, a pellucid, colourleſs liquid, ſometimes yellowiſh or reddiſh (303). Theſe lymphatic veſſels together

(303) Lymphatic veſſels differ from the veins which terminate in the heart, in many reſpects. They are not full in the dead body, as veins are; neither do they contain a coloured liquor. They are more irritable than either arteries or veins, and they have more valves than the latter, as is evident from their knotty appearance. Their ramifications are more numerous by far, and more contiguous one to another than thoſe of arteries or veins. They ſometimes run two or three feet, without ramifying, which the blood-veſſels never do. Their branches alſo bear a very different proportion to their trunks, from what the branches of the blood-veſſels do (See Note 287.): Mr. Cruickſhank ſaw a lymphatic coming out of a gland in the groin, that was larger than any part of the thoracic duct, except its beginning and termination (Anatomy of the abſorbing veſſels, p. 90.).

with the *Lacteals*, which may be more properly called the *Lymphatic Veſſels of the Inteſtines* ([304]), and the common trunk, or *Thoracic Duct*, and the round bodies, or *lymphatic glands* as they are called, conſtitute the *Lymphatic Syſtem* ([305]).

As to the fabric of the lymphatics, they are compoſed of membranes, thin and tranſparent, yet ſtrong enough, conſidering their nature; theſe membranes are endued with muſcular fibres, proper veſſels and nerves, as is clearly demonſtrated from their irritability in evacuating their liquid contents, and from their becoming inflamed and painful ([306]). Like

([304]) Why more properly called *Lymphatic Veſſels* of the Inteſtines? The body is not nouriſhed by lymph, but by chyle; and it is the office of theſe veſſels coming from the inteſtines to carry chyle into the blood. There is no other *route* for the chyle into the blood, than by theſe veſſels. Neverthelcſs, though it be certain that the thoracic duct is a common trunk both to the lymphatics, and to the lacteals, yet the diſcoverers imagined the lymphatics to be a diſtinct order of veſſels from the lacteals, which they called *Venae Lacteae*. Moreover, the lacteals tranſmit lymph, when the chyle is all carried to the ſubclavian veins; and the lymphatics, which ordinarily carry only lymph, have, in conſequence of an anaſtomoſis of the lymphatics of the liver and diaphragm with the lacteals of the meſentery, been found full of chyle (Haller n. 1. and 4. on § 121. of *Boerh. Pracl. in Prop. Inſt.* alſo Cruikſhank, p. 89.).

([305]) It is now-a-day called the *Abſorbing Syſtem*, for the red veins do not abſorb.

([306]) Though fibres can ſcarcely be ſeen in the thoracic duct of man, yet Mr. Cruikſhank ſaw them very remarkable in an uncommonly large one. He has de-

Like other veins, they have many valves diſpoſed in pairs; in ſome places, three or four pair of valves occur in the ſpace of an inch, to hinder the return of the contained liquid (307).

They *ariſe* by very ſmall ramifications from

demonſtrated that the lymphatic veſſels conſiſt of coats, and that each coat conſiſts of fibres. His method was this; he inverted a portion of the thoracic duct of a horſe, and drew it on a glaſs cylinder (p. 61.).

As the Arteries and Veins are vaſcular, ſo likewiſe the abſorbents have their *Vaſa Vaſorum.* The inflammation of them is a proof of their having arteries and veins, had not the former been frequently filled with coloured matter. They muſt alſo have abſorbing veſſels.

Are the abſorbents ſenſible? They are certainly irritable; but this may depend on their muſcular part.

(307) The figure of theſe valves is that of a parabole; attached by its circular edge to the inſide of the abſorbent veſſel, its detached edge, which marks the diameter, fluctuating looſely in the cavity. Hence fluids can only go one way in theſe veſſels, for if they be driven backwards, the valve is raiſed from the ſide, and its looſe edge is thrown into the diameter of the cavity of the veſſel. Now there being commonly a pair of valves, both being raiſed by the retrograde motion of the contained fluid, and both being oppoſite each other, it follows that, in ſuch inſtance, the route of the fluid muſt be entirely ſtopped. Mr. Cruikſhank ſays they are frequently found interſecting the veſſels, at equal diſtances, about the eighth or ſixteenth of an inch apart (p. 66.). There are generally ſeven or eight pair of valves in the length of an inch. There is commonly a pair wherever an abſorbent enters a vein, or when it enters the thoracic duct. But ſometimes there is only one. Mr. Cruikſhank ſaw a lymphatic veſſel paſs the length of ſix inches, without a ſingle valve.

the

the whole ſurface of the body ([308]), from the ſubcutaneous cellular membrane ([309]), and from the larger cavities ([310]); from the breaſts ([311]), and laſtly, from the various *viſcera*. Theſe ramifications coming gradually together, form themſelves into branches, and theſe branches, after the ſame manner, terminate in one common trunk.

They are terminated in the thoracic duct, into which they evacuate their contents: Nevertheleſs, ſome of them are inſerted here and there in the greater red veins ([312]). Before they are terminated in the common trunk, they enter the lymphatic glands, as they are called, in their courſe, and go off from their op-

([308]) Hence mercury is abſorbed from the ſkin, and carried into the blood, to affect the ſalivary glands; hence alſo the venereal and other poiſons contaminate the whole habit.

([309]) In animals dying of hemoptoë, when blood is effuſed into the cells of the lungs, it may often be ſeen in the lymphaties. Beſides, injections, that are extravaſated, frequently get into the lymphaties.

([310]) Thus is Dropſy often cured.

([311]) Whenever the lactiferous tubes are filled with mercury, the lymphaties are likewiſe filled.

([312]) Mr. Cruikſhank ſays he never ſaw a lymphatic veſſel inſerted into any other red veins, than the ſubclavians and jugulars (p. 99.): though Profeſſor Meckel, the Father, had aſſerted, that the lymphaties of the ſtomach communicate with the veins of that part *(Diſſ. Epiſt. ad Hallerum.)*; and Meckel, the Son, had affirmed the ſame of the abſorbents of the ear *(Diſſ. De Labyrinthi auris contentis*, &c.).

poſite

poſite ſide to arrive at the thoracic duct (313).

They are preſent, perhaps in every part of the body, and alſo on the ſurface of almoſt all the *viſcera*, e. g. in the moſt remote parts of the ſuperior and inferior extremities, in the face, in the muſcles of the tongue, in the neck, in the lungs, in the liver, in the ſpleen, in the meſenteric glands, in the breaſts, in the teſticles, in the ſpermatic cord, about the *aorta* and iliac veins; and, in ſhort, wherever there are lymphatic glands.

Of their *Uſe* it may be ſaid, they abſorb the fluids depoſited on the ſurface of the body, the coagulable lymph from the greater cavities, and the chyle from the cavity of the inteſtines. All theſe they carry to the thoracic duct, that they may there be mixed and diluted one with another (314).

(313) As they enter a gland, they acquire the name of *Vaſa Inferentia*: as they go out, they are called *Vaſa Efferentia*. The *Vaſa inferentia* are almoſt always more numerous than the *afferentia*; but they are not ſo large. The *vaſa efferentia* are largeſt near the thoraic duct.— As we are certain that the thoracic duct cannot be filled from either of the lower extremities, without the injected matter paſſing, at the ſame time, through a greater or leſs number of glands, may we not reaſonably infer, that no lymphatic enters that duct, that has not previouſly gone through a gland? Mr. Cruikſhank makes one exception to this, which is, that the thoracic duct may be injected from lymphatic veſſels on the back, without any gland being injected (p. 79.).

(314) Haller could hardly believe that the chyle can be thus diluted, becauſe lymph is itſelf gelatinous (*Nota* 2. *in* § 126. *Boer. Prael. Acad.*).

The fluid of the lymphatic veſſels, of the cellular membrane, and of the cavities of the body, ſeems to differ from the lymph of the blood in this only, that it contains water (315).

Of the Lymphatic Veſſels.

There are *two claſſes of lymphatic veſſels, belonging to the lower extremities*; of which the one is *ſuperficially*, but the other *deeply* ſeated (316). We ſhall conſider both claſſes.

I.

The *ſuperficially ſeated lymphatics* lie between the ſkin and muſcles, and are to be referred to the common integuments of the body. One branch runs from the toes upon the back of the foot, and aſcends the tendon of the *cruraeus anticus* muſcle; is often di-

(315) Certainly the lymph of the blood contains water alſo. Mr. Hewſon could conceive no difference between the fluid of the lymphatic veſſels and that of cavities; but Mr. Cruickſhank could never coagulate the latter in a leſs heat than would riſe the mercury to 140 or 160 of Farenheit's ſcale (p. 105.).

(316) The ſuperficially ſeated lymphatic veſſels of the extremities are by far more numerous than the ſubcutaneous veins; the former being often in the proportion of fourteen to one.—The deeply ſeated lymphatics of the extremities are, at leaſt, twice as many as the arteries, which they attend: they ariſe by the ſides of the toes, and like the veins accompany the arteries, two on each ſide of an artery.

vided

vided above the ancles, and forms a kind of *plexus*, proceeding along the *tibia* under the ſkin, and in the cellular membrane between that bone and the *gaſtrocnemius* muſcle, as high as the inſide of the knee; from hence again, immediately under the ſkin and above the muſcles of the thigh to the *groin*, where theſe various branches paſs through the lymphatic glands ([317]).

Of theſe glands, of which there are ſix or eight, ſome are ſituated in the angle which the thigh makes with the abdomen, but others lie a little deeper, in the anterior part of the thigh. The lymphatic veſſels already mentioned enter the laſt of theſe glands, one only excepted, running to the ſuperior glands, through which theſe lymphatics paſs, that comes from the *pubis*. It is from this cauſe, that venereal buboes are almoſt always in the ſuperior glands; and, on the contrary, that the inferior lymphatic glands are principally affected by *pus* abſorbed from diſeaſed bones. The lymphatics of the genitals, with thoſe already mentioned, form a net-work, which entering the cavity of the abdomen under Poupart's ligament, gives off branches which in part ſurround the iliac artery, but are chiefly beſtowed on its internal ſide ([318]).

All

([317]) Not always; for ſometimes two or three paſs by the glands of the groin, entering no gland till they have paſſed under Poupart's ligament.

([318]) The number of the inguinal glands is uncertain.

The

All theſe ſuperficial veſſels, as one may rationally conjecture, are trunks of branches deſtined for abſorption, in every part of the lower extremities, in the cellular membrane, and under the ſkin.

From the foot to the groin, there is in general no lymphatic gland for theſe veſſels to paſs through; but this is not always the caſe.

II.

The *Second Claſs* of lymphatic veſſels belonging to the lower extremities, as was obſerved above, is more deeply ſeated, between the muſcles, and accompanies the femoral artery. The firſt of theſe trunks is ſituated next the internal ancle, and runs with the poſterior tibial artery. From hence it aſcends the bone poſteriorly under the muſcles, meets a ſmall lymphatic gland in the middle of the leg [319], and always adheres next the artery; coming from this gland again it aſcends into the ham, and ſinks into two lymphatic glands.

The branches aſcend from thence with the femoral artery, over the *biceps* muſcle, into

The greater number are above the *faſcia* of the thigh; but a few are ſeated upon the *iliacus internus* muſcle, between the *triceps* and *ſartorius*. Mr. Cruikſhank never ſaw any glands between the poplitaeal and inguinal (p. 133. 134.).

[319] As Leber copied Hewſon on the Lymphatic veſſels, ſo, it is probable, he firſt and only heard of this gland from him.

ſome

ſome inguinal gland ſituated more deeply than any of the reſt; but, at laſt, into the *inferior* ones, as we have called them, where uniting with the lymphatics of the firſt claſs, and others coming from the *pubis*, the whole of them enter the cavity of the abdomen, through the abdominal ring.

The Lymphatic Veſſels of the abdominal and thoracic Viſcera.

Some branches accompany the external iliac artery from the abdominal ring to the brim of the *pelvis*; others paſs through this cavity as far as the iſchiatic notch, running in the courſe of the internal iliac artery; in which courſe, they meet others coming from the urinary bladder, from the uterus, or ſpermatic veſſels, and a few ariſen from the *glutaei* muſcles. In the gravid uterus, lymphatic veſſels are eaſily detected. Again:—Others are carried with the external iliac artery over the *pſoas* muſcle under the aorta to the loins; then to the *os ſacrum*, where, together with the veſſels of the other ſide, they conſtitute regular and elegant net work, over againſt the *pſoas* muſcle. There are very many lymphatic glands between Poupart's ligament, and the lumbar region.

Being collected one after another, together with the lacteal veſſels, they form the thoracic duct under the *aorta*, at the ſecond vertebra of the loins.

The

The abdominal viſcera alſo ſend their chief branches to the thoracic duct.—From the *Kidneys* a great *plexus* comes, which runs backward from the renal veſſels, and unite with ſome trunks at the aorta. The veſſels likewiſe which ariſe from the renal glands proceed to this place.

The lymphatic trunks of the ſpleen are ſeated in its concave ſide, accompany the artery from thence to the pancreas, and are united in its concavity with thoſe of that *viſcus*.

The *Stomach* has two kinds of theſe veſſels. Some run on its leſs curvature, with the coronary vein, and paſs through glands ſituated there; others creep along the larger curvature with the right gaſtric artery, and paſs through ſimilar glands. Both theſe kinds of veſſels meet at the inferior orifice of the ſtomach, and make a net-work at the leſs flexure of the duodenum, with which the lymphatic veſſels of the ſpleen, gall-bladder, and liver, are interwoven. This net-work, above and below the inteſtine, paſſes to the thoracic duct.

The larger *viſcera* of the abdomen have for the moſt part, a double claſs of lymphatic veſſels: the one ſituated ſuperficially, the other deeply, and accompanying the larger arteries. In the *Liver*, both claſſes communicate. Some of them, which are placed on its convex ſurface, deſcend with the deſcending *cava:* others are ſent in the direction of the right ligament, to the diaphragm and thoracic duct. The veſ-

ſels

ſels of the concave ſurface are joined with thoſe coming from without at the *vena portae.*

The lymphatics of the ſtomach are all inſerted in the thoracic duct.

The Lacteals, Receptaculum Chyli, and Thoracic Duct.

The *Lacteals* are tender, tranſparent lymphatics, poſſeſſed of many valves which ariſe from the ſmall and large inteſtines, abſorb the chyle prepared in the inteſtines, and carry it to the *receptaculum chyli.* They ariſe from the internal ſurface of the villous coat, perforate the other coats, and form a kind of net-work; whilſt the greater number unite one with another, in the third cellular coat, between the muſcular and the external; from hence they proceed, between the *laminae* of the meſentery to the conglobate glands ſituated there; through which they paſs, and conſtitute the greateſt part of a gland, being diſtributed through it many times. The Lacteals having paſſed from theſe glands, go to others, and at length ſeek thoſe in the centre of the meſentery, contiguous to one another. From theſe glands only four, five, or perhaps more lacteals, paſs out, aſcend with the meſenteric artery, and unite with the lymphatic veſſels of the lower extremities, and of the abdominal

viſcera, conſtituting at length a veſſel which is called *Receptaculum Chyli* (320).

The *Uſe then of the Lacteal Veſſels* is to abſorb the chyle and carry it to the *Receptaculum chyli.*

The *Receptaculum Chyli is a large membranous ſack*, ſituated between the *aorta* and the right *crus* of the diaphragm; but extended above the diaphragm into the cavity of the cheſt.

Its *Figure* from above and below is conical, hence it is wider in the middle, but in ſuch a proportion, that its diameter never exceeds three lines, though its length exceeds two inches. So it happens, for the moſt part; yet in the place of one *receptaculum chyli*, there are ſometimes two or three leſs ducts.

The uſe of it is to receive, to mix, to dilute, and to attenuate the coagulable lymph brought

(320) In turtle, and in fiſh, as well as in certain quadrupeds, the dog eſpecially, this enlargement is of a greater ſize, in proportion to the duct, than in man, in whom it is ſo ſmall as ſcarcely to deſerve the appellation of *Receptaculum Chyli* (See Hewſon's Exp. Inq. Part II. and Cruikſhank.).

The thoracic duct, formed of the trunks of the abſorbents of the right and left leg, and the trunk of the lacteals begins commonly on the left ſide of the ſpine, on the third *vertebra* of the loins. The three trunks ſometimes lie parallel one to another, without being joined, for the ſpace of an inch or two. At the firſt lumbar *vertebra*, when the thoracic duct gets above the diaphragm, it lies on the right ſide of the anterior ſurface of the ſpine, between the *vena azygos* of the right ſide, and the *aorta* of the left. Perhaps the pulſe of the *aorta* contributes to propel the abſorbed fluids of the thoracic duct into the blood (See Cruikſhank.).

from the lower extremities, and abdominal *viſcera*; alſo chyle already diluted in ſome degree, in the meſenteric glands.

The *Receptaculum Chyli* is terminated in the *Thoracic Duct*, ſo called from the courſe which it takes.

This *Thoracic Duct* is ſituated behind the *pleura*, between the *Aorta* and *Vena Azygos*. Being variouſly reflected, it aſcends, and receives in its courſe the lymphatics of the ſtomach, the *oeſophagus*, and the lungs.

The *Figure of the Thoracic Duct* is that of a cylinder; yet it is often divided, eſpecially at its ſuperior part, and again conjoined into one tube. It paſſes towards the left, behind the *oeſophagus* to the fifth *vertebra* of the back: it aſcends through the left ſide of the thorax behind the ſubclavian veſſels, to about the ſixth *vertebra* of the neck; from hence it deſcends, ſometimes ſingle, ſometimes bifurcated, and is inſerted at the union of the ſubclavian with the internal jugular vein ([321]).

It

([321]) The Thoracic duct is inſerted into the left ſubclavian vein, chiefly becauſe its contents ſhould not be ſtopped by the retrograde motion of the blood in the *cava ſuperior*, and its branches, during the contraction of the right auricle.

Though it did not appear from Haller's Experiments, that the Thoracic Duct or Lymphatics become painful upon the application of ſtimulants; yet the thoracic duct, throughout its whole length, is ſurrounded by the ramifications of the *par vagum* and intercoſtal. And what is ſtill to be noticed is, that in ſome experiments of Mr. John Hunter (Dr. Hunter's Med. Comment. Chap. V.),

when

It poſſeſſes few valves, and thoſe placed without order; but before its aperture there is a valve almoſt circular, impeding the ingreſs of blood into its cavity ([322]).

The thoracic duct is ordinarily found of the form above deſcribed, yet there are inſtances where it is double, but afterwards joined again into one trunk. It is likewiſe ſometimes divided into two branches at its end, and inſerted by means of theſe into both ſubclavian veins; or one branch is inſerted into the *vena azygos*, or left jugular vein.

But when it is terminated by many branches, a valve is placed at the end of each.

Of its uſe it may be ſaid, that it mixes the chyle brought from the lacteals to the *receptaculum chyli*, and propels it onwards to the veins already mentioned.

In the *lungs*, ſome veſſels paſs from each lobe to the thoracic duct, others anteriorly to the jugular, or to the ſubclavian vein.

It is particularly to be noticed at preſent, that all the lymphatic veſſels of the abdominal *viſcera* do not paſs through glands, and the ſame is to be obſerved of the lacteals; hence a waſting of the body ſhould not always be

when the arteries and veins and nerves of the inteſtine were tied up, and conſequently the connection of the brain and lacteals deſtroyed, the fluids were nevertheleſs abſorbed by the lacteals from the cavity of the inteſtines.

([322]) There is great variety in the diſtribution of the valves of the abſorbents, in different bodies: ſometimes the thoracic duct has only three or four pair of valves: ſometimes it is crowded with them (Cruikſhank, p. 66.).

attributed

attributed to an obſtruction of the meſenteric glands.

It might not have been unneceſſary to have inſerted in this place a more exact deſcription of the lymphatic glands.

Beſide the glands of the *Meſentery* and thoſe of the Meſocolon and *Stomach*, there are many others proper to the Pancreas, ſituated on each ſide eſpecially near the duodenum. In the *Omentum* alſo there are generally two. On the inſide of Poupart's ligament, there is a large lymphatic gland: and there are various glands on the pſoas muſcle, and in the pelvis at the internal iliac artery, and again there are many glands ſituated at the vertebrae of the loins. The *Kidneys*, the *Supra-renal glands*, the *Spleen*, and the *Liver*, have each their proper lymphatic glands. There are ſome glands in the middle of the thorax at the thoracic duct, near the egreſs of the lymphatic: numerous glands are alſo preſent at the root of the lungs; but in the lungs there is no gland. Laſtly, there are ſome glands between the ſurface of the lungs and the ſubclavian veins; others in the angle which this vein forms with the jugular, at the angle near the pharynx, and ſometimes inferiorly between the ribs. The black glands at the branches of the *aſpera arteria*, are altogether of the ſame nature as the lymphatic glands, as will be noticed in the *Adenologia*, and ſecrete no mucus. Similar glands are not conſtantly found at the column of the ſpine of the

the back. Moreover, lymphatic glands are found near the maxillary and parotid glands; near the mental and occipital arteries; and at the maſtoid proceſs. Theſe glands ſometimes ſwell from abſorbed pus, wounds of the head, or abſceſſes, from rotten teeth, or ulcers of the lips.

The Lymphatics of the Neck and Head.

A Lymphatic Veſſel runs along with the internal jugular vein, which conſtitutes the trunk of thoſe occupying the middle part of the head and neck: ſome branches accompany the external carotid. Lymphatic veſſels are not diſcernible in the brain; neither is the pineal, nor the pituitary gland, of the lymphatic kind; but it is probable that even the brain has lymphatic veſſels.

The ramifications about the external carotid unite in the neck into one trunk, accompanying the jugular vein, and paſſing through lymphatic glands near the termination of this vein in the ſubclavian. There are too ſome lymphatic glands at the angle of the jugular and ſubclavian vein, through which the lymphatic veſſels, coming from the poſterior part of the neck, and ſcapula, paſs.

The *Thyroid Gland* has many lymphatics, which may be rendered more conſpicuous by inflating them with air. One part goes to the angle already noticed, another to the thoracic duct.

The

The Lymphatics of the Upper Extremities.

As of the inferior, ſo of the ſuperior extremities, there are two claſſes of lymphatic veſſels; the one ſeated ſuperficially, the other deeply.

I.

The ſuperficially ſeated lymphatics are beſt ſeen in the emaciated and dropſical; they aſcend under the ſkin upon the poſterior ſurface of the fore-arm, and proceed onward to the head of the *radius:* one branch aſcends in the internal ſurface, is extended under the internal condyle of the *humerus*, and ſends forward a ſmall branch, over the tendon between the muſcles and the bones, where it is joined with another more deeply ſeated, while the other branches aſcend from the head of the *radius* over the *ſupinator longus*, and *biceps* muſcle, and paſs through the lymphatic glands of the axilla. But the particular branch, from which the ſmaller one already noticed was ſent, aſcending over the articulation, reaches a gland; from which it paſſes on the inſide of the fore-arm to the axillary glands. Another lymphatic veſſel goes along the fore-arm anteriorly from the metacarpus, and forms a net-work with another coming over the cubit from the poſterior ſide, which is continued inwardly on the humerus to the glands of the *axilla.*

II.

Of the deeply-feated lymphatics aecompanying the larger blood-veffels, we fhall at prefent efpecially defcribe that which follows the radial vein. It runs between the cubital and interoffeal artery, and internally accompanies the brachial artery: in the middle of the *humerus* it goes through two glands, and then being divided, it rather emerges, paffes under one of the anaftomofing arteries, and afcends to the lymphatic axillary glands. But fuch branehes, as it appears, accompany all the larger arteries. For that abforbent veffels fhould be prefent in every part of the arm is evident in inoeulation for the fmall-pox, which, confidering the part wherein the virus is inferted, always fuceeeds.

Two principal branches of the lymphatic veffels belonging to the fuperior extremities, unite into one trunk under the fubclavian vein, which is commonly inferted in the angle of the vein, at the entrance of the thoraeic duct. In that place, it is joined with branehes from the head, neck, thyroid gland, and anterior part of the lungs.

All that has hitherto been faid refpects the left fide. The abforbents of the right fide, for the moft part, follow the fame courfe. A trunk, joined to the thoracic duct, has four principal branches, one coming from the arm, and the other three from the thyroid gland, head,

head, and lungs [323]. The difference of this courſe of the lymphatic veſſels on the right ſide being plainly perceived, will ſerve for the explanation of topical tumours.

[323] The principal trunk of the abſorbents being now deſcribed, which enters the angle formed by the left jugular and ſubclavian vein; we come next to ſpeak of that which is inſerted in the ſame angle, on the right ſide. The length of this is generally a quarter or half an inch only. Its diameter is like that of the thoracic duct of the left ſide, at the ſame place. It is formed of the abſorbents of the right lobe of the liver, the right ſide of the diaphragm, the right ſide of the heart, the right lobe of the lungs, the right arm, the right ſide of the head, and the right lobe of the thyroide gland.

The reaſon that the trunks of the abſorbing veſſels terminate in veins, and not in arteries, is becauſe in the former there is leſs reſiſtance to the influx of the chyle than in the arteries, where the motion of the blood is quicker. They terminate in the angles between the jugulars and ſubclavians, becauſe the reſiſtance of the blood to any fluid entering the veins, muſt be leſs, as that blood comes nearer the heart.—They enter at the angle; becauſe the abſorbed fluids may go in the ſame diagonal as the blood of the jugulars and ſubclavians (See Cruikſhank.).

END OF THE FIRST VOLUME.